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PARTICULATE DATA REDUCTION SYSTEM

(PADRE)

USER GUIDE

by

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16. ABSTRACT The report, a user guide, describes the capabilities and use of the Particulate Data Reduction (PADRE) system, an interactive computer program that facilitates entry, reduction, and analysis of cascade impactor data for particle size distributions. Example sessions are provided to illustrate the system's capabilities. Calculations, algorithms, and messages are documented in a separate PADRE reference manual. PADRE was developed to ensure the quality of data included in the Fine Particle Emissions Information System (FPEIS), which is the particle size measurements component of the Environmental Assessment Data Systems (EADS). Users control the logical flow through the system in response to prompts from the program. PADRE can be used to store, review, edit, and analyze data and, through a variety of data checks, to identify invalid or suspect data. Impactor stage cut points can be calculated; cumulative and differential mass concentrations can be determined and interpolated to standard diameters. The PADRE system, installed at EPA's National Computation Center at Research Triangle Park, may be made available to users of cascade impactors.

17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution	Pollution Control	13B
Particles	Stationary Sources	14G
Size Determination	Particulate	14B
Dust	PADRE System	11G
Aerosols	Cascade Impactors	07D
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ABSTRACT

The Particulate Data Reduction (PADRE) system is an interactive computer program that facilitates entry, reduction, and analysis of cascade impactor data for particle size distributions. PADRE was developed to ensure the quality of data included in the Fine Particle Emissions Information System (FPEIS), which is a component of the Environmental Assessment Data Systems (EADS). Users control the logical flow through the system in response to prompts from the program. PADRE can be used to store, review, edit, and analyze data and, through a variety of data checks, to identify invalid or suspect data. Impactor stage cut points are calculated and cumulative and differential mass concentrations are determined and interpolated to standard diameters. This document describes how to access and use PADRE and summarizes its logic and capabilities; it is intended as a working reference for users who are at a computer terminal. A separate reference manual details the technical basis for the program design and computational methods used.

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SECTION 1

INTRODUCTION

PURPOSE

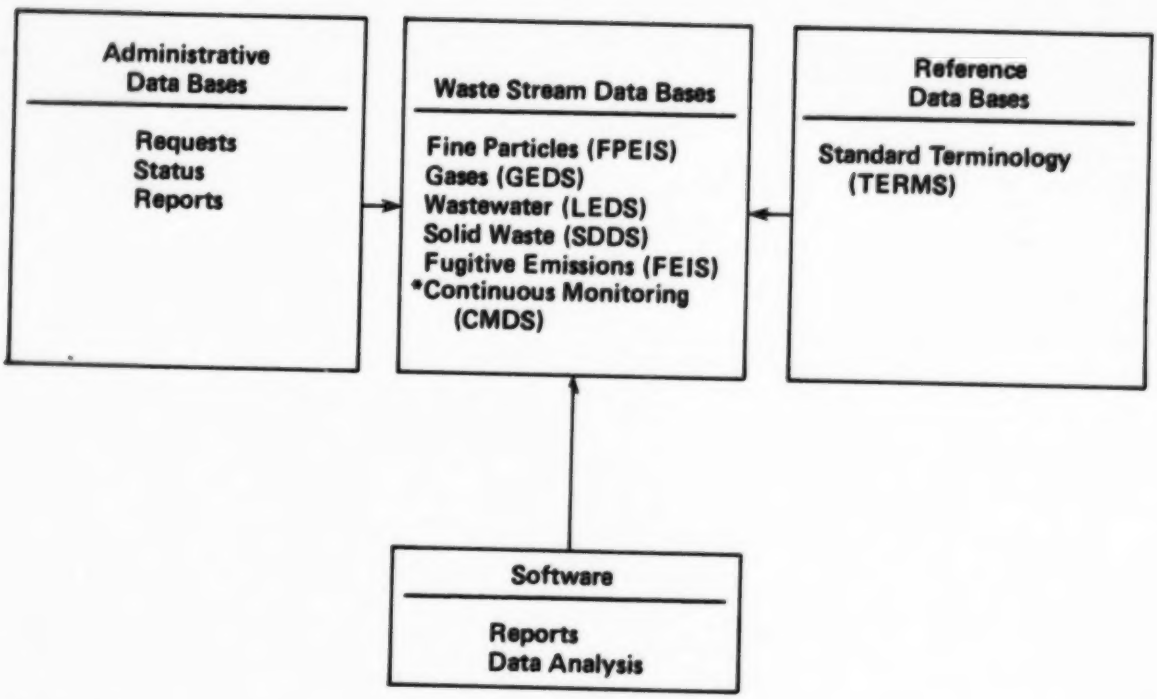
This document describes the capabilities and use of the PArticulate Data REduction (PADRE) system. It is intended as a working reference for users who are at a computer terminal. For more detailed information about calculations and algorithms, see the PADRE Reference Manual (in preparation).

The purpose of the PADRE system is to facilitate entry of validated cascade impactor data from representative in-stack runs into the Fine Particle Emissions Information System (FPEIS),[1] which is a major component of the Environmental Assessment Data Systems (EADS). Cascade impactor data can be entered, reduced, and compared through PADRE. Reduction of observed data to determine the effective stage cut diameters as well as the cumulative and differential mass concentrations takes only a few seconds; this capability permits test plans or operating conditions to be modified during a test to optimize data quality. Data entered through PADRE are not automatically included in FPEIS; the test contractor is expected to designate representative runs after he has validated the data.

HISTORY

Data reduction is based on the CIDRS computer programs developed by the Southern Research Institute (SoRI).[2] PADRE allows data reduction from a wider variety of impactor types and configurations than does CIDRS. Additionally, PADRE is interactive, which facilitates data entry and allows rapid analysis of impactor data by novice computer users.

FPEIS[3] was developed in the mid-1970's and became fully operational in January 1977. The Industrial Environmental Research Laboratory at Research Triangle Park (IERL-RTP) then developed a series of data bases modeled on the FPEIS concept that would be capable of reporting multimedia discharge information uniformly and consistently. This work resulted in EADS,[4] which is both a resource for producing evaluated information and an environmental data repository (see Figure 1). Its structure, as Figure 2 shows, permits full characterization of all data with minimum redundancy.



*Planned or proposed EADS components.

Figure 1. Environmental Assessment Data Systems (EADS) Overview.

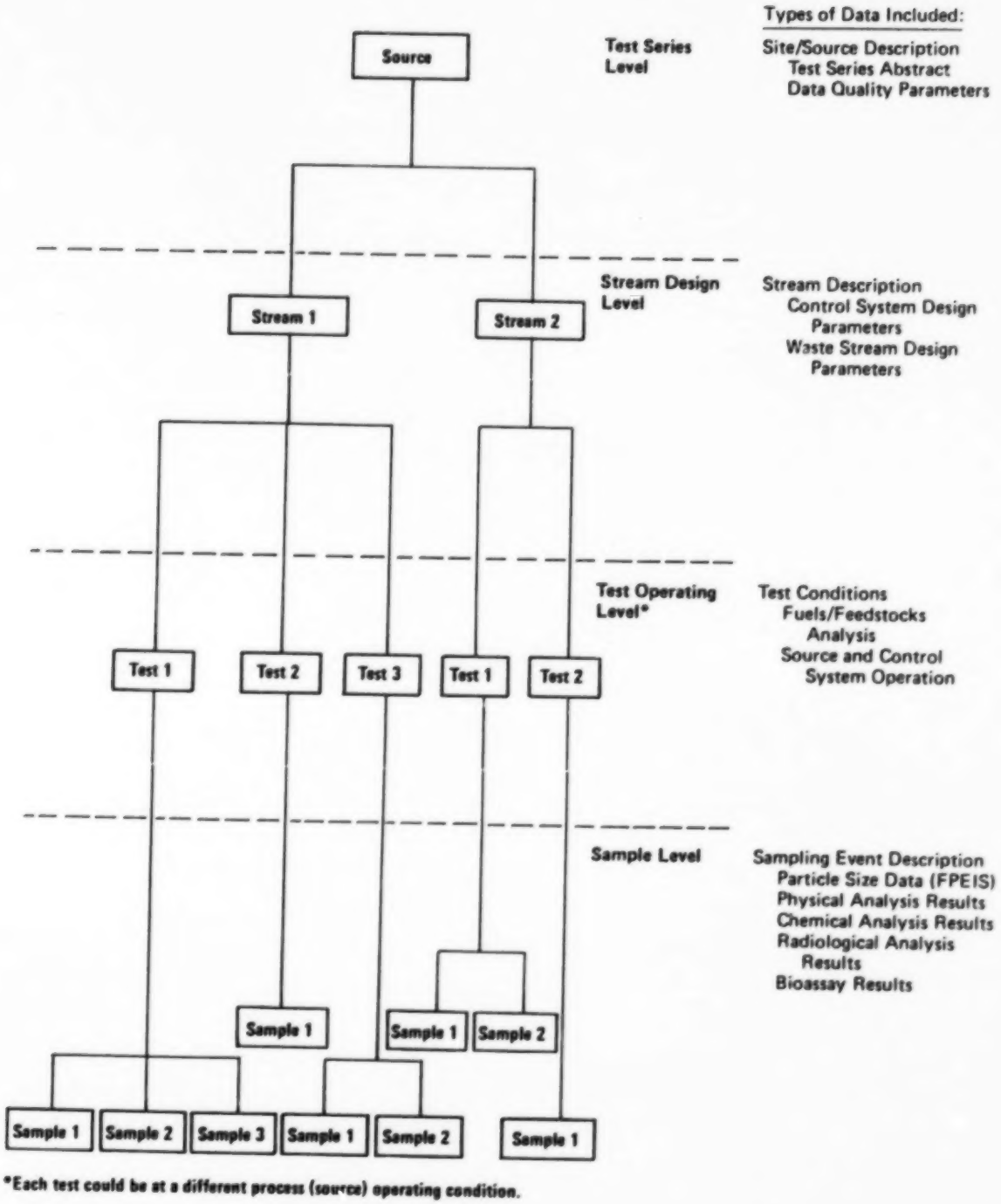


Figure 2. EADS data organization.

SECTION 2

OVERVIEW

DATA ORGANIZATION

Data organization and terminology are as consistent with EADS/FPEIS as possible (see Figure 2). Thus, for PADRE several impactor runs (samples for EADS/FPEIS) are logically connected to one test, with specification of the stream and operating levels embedded within the run data records. In particular, all runs for a given test share a common site and particle density and begin on or after that test date. PADRE utilizes user-specified keys (described below) to access all stored data. Three data categories may be entered by PADRE users: weight data, test data, and run data. A fourth category, impactor data, must be supplied to the EPA PADRE Project Officer before data can be reduced.

- Weight data include a description of the substrates, pre-weights for each substrate, and post-weights for each substrate. Net weights are calculated from pre-weights and post-weights. Substrate pre-weights are entered into the system independently of run data. PADRE will assign a substrate's ID number when the pre-weights are first entered; users must specify this ID number when they enter run data.
- Test data are the same for of a given test runs. These include the test comments, (assumed) particle density, site code, and test date.
- Run data include run comments, operating conditions, identification of impactor used, and ID number of the set of substrates used in the impactor.
- Impactor data include brand name, model, serial number, calibration date, and number of stages. For each stage, the number of jets, average jet diameter, Stokes' number, and cumulative fractional pressure drop are required.

Data are entered and stored in units where they are commonly observed to facilitate data entry and correction. Data are converted to metric units before inclusion in the FPEIS.

DATA PROCESSING

PADRE involves four processes:

- data entry
- data reduction
- data comparison
- data designation

In the entry process observable data are read from an interactive computer terminal operated by the user. These data may then be reviewed and modified. In the reduction process, effective cut points (stage D_{50}'s) and mass concentrations for each impactor stage are computed under actual operating conditions. Mass concentrations are interpolated to standard intervals. In the comparison process, data from several user-specified runs are reduced and statistics at each standard diameter are computed. In the designation process, observable data from user-specified runs are printed in the format of EADS data input forms. The user may submit these forms to EPA to include data in the EADS.

Figure 3 is a diagram of the PADRE system showing the relationship of each of these processes to the data sources and data files. Such a diagram has four elements: (a) data represented by arrows with the name(s) of the data they represent, (b) processes represented by circles, (c) files represented by straight lines, and (d) sources and sinks of data represented by rectangles.

Figure 3 has only two data sources--the PADRE user (test contractor), and the PADRE support staff which reports to the EPA Project Officer. The user interactively supplies weight data, test data, run data, selection criteria (test or run keys), and comments. The user receives a data review report, an abbreviated analysis report, an expanded analysis report, a run comparison report, and FPEIS coding forms. The support staff receives impactor description and calibration information from the users (independently of the PADRE system) and loads it into the impactor description file for reference by PADRE. The support staff also receives comments from users through the comments file.

Four data files are associated with the PADRE system. The weight file contains weight data. The trial data file contains test data and run data. The impactor description file contains descriptive data and calibration constants for specific cascade impactors. The comments file contains comments from PADRE users concerning the system and its documentation.

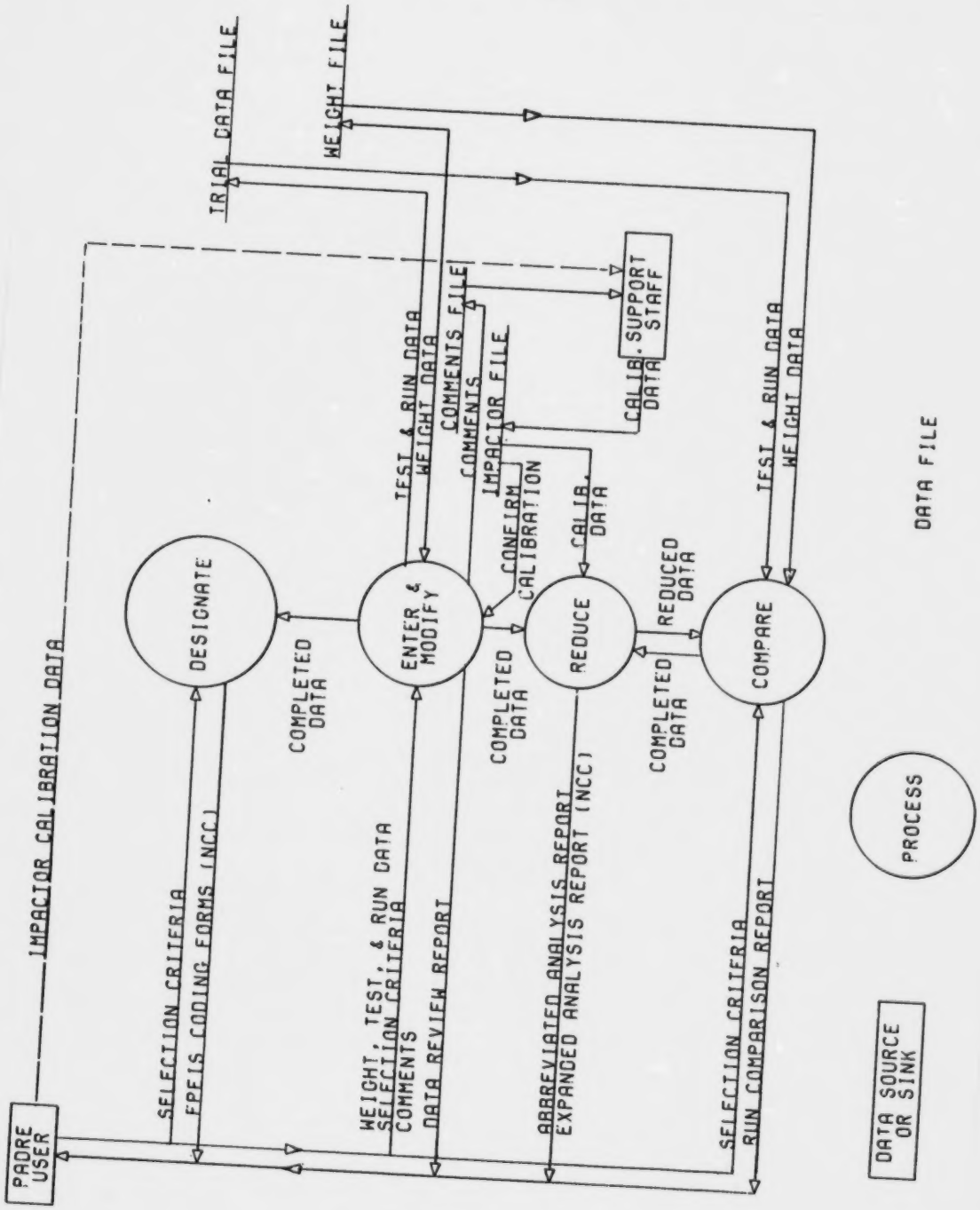


Figure 3. PADRE system diagram

Data Entry

Data input--

The user is prompted for each data item. The prompt includes a description of the datum and variable name PADRE assigns the datum; e.g., ENTER IMPACTOR TEMPERATURE, TIMP (DEG F). This variable name (TIMP) may be used later to update the datum if an error is detected. After all data in a category (weight, test, run) have been entered, they are printed for user review and validation.

Internal data checks--

Before data are stored, PADRE checks for several types of errors. If numerical data are expected, nonnumerical data are rejected immediately and the user is asked to reenter numerical data. Negative particulate weights are detected as soon as the substrate post-weight is entered; the user is immediately offered an opportunity to correct the post-weight.

After all data for a new impactor run have been entered, as many values as possible are checked by PADRE. Inconsistent or suspicious values (outside the normal range) cause warnings to be printed at the terminal and on the expanded output. These warnings are preceded by three asterisks. Warning messages and their corresponding conditions are listed in Table 1. These checks are performed whenever data are entered, retrieved, or modified. Actual operating conditions for a test may include some valid values outside the normal range, which will produce warnings that can be safely ignored. However, the user should review carefully all warnings and assure himself that corresponding data are correct.

Within data reduction procedures, some data are critical. For example, if a variable is used as a divisor, a zero value will cause program termination beyond PADRE's control. If PADRE detects an invalid value for a critical variable, the run is marked as containing dangerous data. An error message preceded by five asterisks is printed on the terminal as well as on the expanded output. Error messages and their corresponding conditions are listed in Table 1. These checks are performed whenever data are entered, retrieved, or modified. When a user retrieves a run that contains one of these errors, he may only list or modify it. The data reduction process can only be requested for "clean" data. Processes that require reduced data,

TABLE 1. PADRE's Internal Data Checks

Message	Condition
*** AMBIENT PRESSURE, nn.nn, IS LOW----------	PAMBNT < 25.0 in Hg
*** AMBIENT PRESSURE, nn.nn, IS HIGH----------	PAMBNT > 35.0 in Hg
*** CO2 COMPONENT OF STACK GAS IS INVALID----------	$\%CO_2$ < 0
*** CO2 COMPONENT < 20%----------	$\%CO_2$ > 20.0
*** CO COMPONENT OF STACK GAS IS INVALID----------	%CO < 0
*** CO COMPONENT > 10%----------	%CO > 10.0
*** CUT POINTS FOR STAGES n, m ARE SIMILAR OR INVERTED----------	cut point (n) < 1.4 cut point (m)
MEASURED DATA FOR STAGE m WITH D50= n.nn OMITTED FROM INTERPOLATION	
***** CYCLONE CUT POINT, CYCL, > 20 MICRONS----------	CYCL > 20.0 μ
***** FINAL GAS VOLUME, nnn.n < INITIAL VOLUME, nnn.n----------	GMVOLF < GMVOLI
*** GAS COMPONENTS NORMALIZED SO THAT SUM= 100%, NOT nn.n----------	sum of dry gas components ≠ 100.0
*** H2O COMPONENT OF STACK GAS IS INVALID----------	$\%H_2O$ < 0.0
*** H2O COMPONENT > 50%----------	$\%H_2O$ > 50.0
*** IMPACTOR TEMP., TIMP, SHOULD BE > STACK TEMP., TSTACK----------	TSTACK > TIMP
*** IMPACTOR TEMP., TIMP, SHOULD BE < 500----------	TIMP > 500 °F
*** INTERPOLATED CUMULATIVE MASS DECREASES BETWEEN n.nn AND m.mmm MICRONS	interpolated cum. mass not monotonic
*** INTERPOLATED VALUES NORMALIZED TO ACCOUNT FOR OMITTED MASS ON FILTER-	FLARGE = YES
*** JET VELOCITY FOR STAGE n IS HIGH----------	jet velocity > 50 m/s
*** LARGE PARTICLES ON FILTER INDICATE PARTICLE BOUNCE OR REENTRAINMENT. SIZE DISTRIBUTION MAY BE DISTORTED	FLARGE = YES
*** MASS ON CYCLONE IS LOW----------	mass < 0.1 mg
*** MASS ON STAGE n IS HIGH----------	mass > 10.0 mg
*** MASS ON STAGE n IS LOW----------	mass < 0.1 mg
*** MAX. PARTICLE DIAM., DMAX, IS LARGE----------	DMAX > 100 μ
***** MAX. PARTICLE DIAM., DMAX, SHOULD BE > 30----------	DMAX < 30 μ
*** N2 COMPONENT > 90%----------	$\%N_2$ > 90.0
*** N2 COMPONENT OF STACK GASE MAY BE INVALID----------	$\%N_2$ < 60
***** NET WEIGHTS HAVE NOT BEEN CALCULATED----------	AMASS (1) < 0.0
***** NO RECORD FOR IMPACTOR iiiiii, PLATE SET ppp IN DESCRIPTION FILE-----	No record in impactor description file for specified impactor
*** NON-STANDARD CUT POINT, n.nn BELOW 1ST MEASURED CUT POINT, m.mm------	ACUTPT < cut point for last stage
*** NON-STANDARD CUTPT nn.n > MAX. PARTICLE DIAM., mm.m----------	ACUTPT (I) > DMAX
*** NOZZLE CUT POINT = nn.nn < mm.mm = CYCLONE CUT POINT----------	CUTNOZ < CYCL
***** NOZZLE DIAMETER, DNOZZ <= 0----------	DNOZZ <=0.0
*** NOZZLE DIAMETER, DNOZZ > 1 IN.----------	DNOZZ > 1.0 inch
***** NO. OF WEIGHTS, n, INCONSISTENT WITH SPECIFIED IMPACTOR CONFIGURATION	NMASS not consistent with NSTAGE, backup filter (if used)
***** NUMBER OF STAGES USED, nn, INCONSISTENT WITH IMPACTOR DESCRIPTION----	NS ≠ NSTAGE
*** O2 COMPONENT OF STACK GAS IS INVALID----------	$\%O_2$ < 0
*** O2 COMPONENT > 23%----------	$\%O_2$ > 23.0
*** IMPACTOR TEMP., TIMP, SHOULD BE < 500 ----------	TIMP > 500 °F
*** PARTICLE DENSITY, n.nn, IS LOW----------	RHO ≤ 1.0 g/ml
*** PARTICLE DENSITY, n.nn, IS HIGH----------	RHO ≥ 4.0 g/ml
*** RELATIVE STACK PRESSURE, n.nn, IS LOW----------	PSTACK < 15.0 in Hg
*** RELATIVE STACK PRESSURE, n.nn, IS HIGH----------	PSTACK > 40 in Hg
***** RHO SHOULD BE POSITIVE, NOT n.nn----------	RHO < 0.0
***** RTYPE MUST BE I OR O, NOT c----------	RTYPE neither 'I' nor 'O'
*** RUN DATE mmddyy BEFORE CALIBRATION DATA mmddyy----------	IDATE < CDATE
*** RUN DATE mmddyy BEFORE TEST DATA mmddyy----------	JDATE < IDATE
*** SAMPLING DURATION, nn.n, IS SHORT----------	DUR < 3.0 min
*** SAMPLING DURATION, nn.n, IS LONG----------	DUR > 1000.0 min
*** SAMPLING IS AT nn.n% OF ISOKINETIC RATE----------	PCISOK < 90.0
*** STACK GAS VELOCITY, VSTACK, <= 0----------	VSTACK ≤ 0.0 ft/s
*** STACK GAS VELOCITY, VSTACK, > 100 FT/SEC----------	VSTACK ≥ 100 ft/s
*** STACK TEMPERATURE, nnn.n, IS LOW----------	TSTACK < 30 °F
*** STACK TEMPERATURE, nnn.n, IS HIGH----------	TSTACK > 500.0 °F
*** START TIME CANNOT BE NEGATIVE----------	ISTART < 0
*** START TIME MUST BE LESS THAN 2400----------	ISTART > 2400
***** SUM OF THE COMPONENT PERCENTAGES IS NOT 100----------	95% < SUM < 101%
*** VOLUME OF WATER COLLECTED, VOLH2O < 0----------	VOLH2O < 0.0
*** VOLUME OF WATER COLLECTED, VOLH2O > 1000 ML----------	VOLH2O > 1000.0 ml

Note: *** prefixes warnings; ***** prefixes errors which will preclude data reduction.

(e.g., comparison of runs or calculation of control device efficiency) also are prohibited.

The purpose of the data reduction process is to detect incorrect, although apparently reasonable, observable data. Unreasonable reduced data probably indicate incorrect observable data. While the user is the final arbiter of what is unreasonable, PADRE checks some of the reduced data and warns the user of potential problems. Conditions that will produce such warnings include, but are not limited to, the following:

- Jet velocity > 50 m/s
- Cut points inverted
- Cut points separated by < 40 percent
- Nonmonotonic interpolated cumulative mass concentrations.

Data storage--

All data entered through PADRE are stored in FORTRAN direct-access files, which are used only by PADRE. Weight data are stored separately from test data and run data, which allows the pre-weights of several sets of conditioned substrates to be entered before a test begins. The PADRE system assigns a numeric key, or substrate's ID number, to the weight record when the user indicates that he wishes to enter a new set of weights. The key is printed with a reminder to the user to record it for later reference. This key must be specified to retrieve the weight record for completion with post-weights or for reference by the run record.

Test data and run data are stored in the same record in the trial data file. This record also includes the key to the corresponding weight record. Records in the trial data file are referenced with four user-supplied keys: user code, site code, test date, and run number. PADRE determines the user code from the Run-ID field of the @RUN statement at the beginning of the session (see figure 7). The site code and test date are specified by the user when he enters the test data. These codes are the same for all runs in a test. PADRE assigns the run number when the user indicates he wishes to enter data for a new run.

Whenever PADRE stores data, it prints a message with the record keys; e.g.,

SUBSTRATE DESCRIPTION, WEIGHTS SAVED IN RECORD nnn

DATA FOR RUN n BY ccc AT ssss ON mmddyy HAS BEEN SAVED IN THE TRIAL DATA FILE
*** RECORD THESE VALUES IN YOUR NOTEBOOK

Data review--

Data for a run may be reviewed at any time. An important feature of the data review report is that all observable data are printed on the terminal, along with the impactor calibration data, allowing users to validate the data they have entered. It also documents all data that will be used in the reduction process.

Data correction--

The user is prompted with a list of variable names printed on one line. If the user wants to update one or more of the corresponding data, he spaces across the line and enters any character under the variable names(s). The system then prompts the user for a new value of each variable the user marked for update.

ENTER A MARK UNDER EACH VARIABLE YOU WISH TO MODIFY OR RETURN.

PAMBNT DPSTK TSTACK TIMP DMAX CYCL PCTINY

When the user has bypassed an opportunity to update all data in the run, current values are printed for review and the user is asked whether he wishes to make further updates. If the user responds negatively, data are stored; otherwise, the entire update cycle is repeated.

Data Reduction

Once the data have been validated, PADRE can determine quickly the effective cut points (D_{50}'s) for each stage of the impactor as well as the mass and number concentrations. These concentrations are then interpolated to standard diameters to facilitate comparison with data from other runs using different impactors, or with data from runs for the same impactor under different operating conditions.

Although PADRE will not allow data reduction unless post-weights have been entered, if dummy post-weights (e.g., 1 mg > corresponding pre-weight) are entered, PADRE may be run as soon as the operating conditions are known. This will show whether any pair of cut points is too close or inverted, especially useful when an impactor is configured with a cyclone precutter.

PADRE performs data reduction using three definitions of diameter: (1) physical [Stokes'], (2) aerodynamic or Task Group on Lung Dynamics [TGLD],[5] and (3) aerodynamic impaction [Mercer's].[6] For each definition, the user may request output at the terminal. This abbreviated analysis report includes the total mass loading and the maximum observed particle diameter for the run. The mass, mass concentration, cumulative mass concentration, effective cut point, geometric mean diameter, differential mass concentration and differential number concentrations are printed for each stage. These mass concentrations are interpolated to standard diameters (20.0, 15.0, 10.0, 6.0, 2.5, 1.25, 0.625, 0.3, and 0.1)m). Interpolation is only performed within the range of observed data, e.g. if the smallest measured D_{50} is 1.0, no values at standard diameters 0.625, 0.3, and 0.1)m can be interpolated.

In addition to the abbreviated analysis report on the terminal, a more complete expanded analysis report (see sample session 7 in Appendix B) is generated for the line printer at EPA's National Computer Center (NCC). At the end of the data reduction procedure, the user may request that this expanded output be printed and mailed to him. Otherwise, the expanded output will be deleted at the end of the run. Note that the user need request expanded output only once to mark the expanded output file for printing; that file will contain all expanded output for the entire session.

Data Comparison

Data for all or several selected runs in a test may be retrieved and reviewed with a one-line summary for each run. Data for inlet or outlet runs may be reduced and compared in a common, uniform format. For a user-specified definition of diameter, univariate statistics on cumulative or differential mass concentrations at each standard diameter may be calculated. Outliers are noted for inspection. Also, penetration/efficiency calculations at standard diameters may be performed.

Designation of Runs for FPEIS

When the user is satisfied that the data are correct, he may select representative runs for inclusion in FPEIS. PADRE will print the observed data on a line printer at NCC in the format of EADS data entry forms 6 and 7a. This output will be mailed to the user, who should add the remaining EADS forms with the unique Test Series Number and all other required data. Cards punched from these forms should be sent to the EADS Program Manager, who will then process them through the FPEIS data review cycle to check for protocol errors. Runs included in the FPEIS will be deleted automatically from PADRE's trial data file. The FPEIS Users Guide[1] documents an extensive library of programs that can be used to access the particle data and to produce a variety of reports.

SECTION 3

PREREQUISITES

APPROVAL OF EPA

The PADRE system was developed and is installed at EPA's National Computation Center (NCC) in Research Triangle Park on the UNIVAC 1100/83 computer. The system may be made available to all users of cascade impactors: EPA personnel, EPA contractors, and State agencies, as well as commercial and consultant impactor users. EPA provides this resource tool to analyze cascade impactor data with the understanding that users will share validated data from representative runs by submitting them for inclusion in the EADS/FPEIS data base.

Three items of information are required for NCC access--a User-ID, a Run-ID, and an account number. A three-character code assigned by the NCC (frequently the user's initials), the User-ID uniquely identifies each user. Associated with each User-ID is a password, which each user chooses and must change at least every 90 days.

The Run-ID serves several functions for both PADRE and NCC. It is a five-character code. The last three characters must be the user code, one of the keys by which test data and run data are stored and retrieved. The NCC staff also uses the Run-Id to identify to whom PADRE output printed at NCC should be sent. The user code is assigned by the EPA Project Officer.

The account number is provided by the NCC to all users meeting the criteria for using the NCC. Potential users should contact the EPA Project Officer to determine if they can qualify for an NCC account.

DATA

While new users are encouraged initially to practice with PADRE using artificial or sample data, it is assumed that most users will be using actual data from in-stack impactors. PADRE is no substitute for a careful record of all operating conditions and observed data. New users may wish to transcribe these data to PADRE data entry forms (see Figures 4, 5, and 6). This

procedure will help users become familiar with the variable names and brief descriptions used in the prompts, prepare users for the order of the prompts, and ensure that all necessary data have been recorded.

Calibration constants for the user's impactor are required in order to calculate the D_{50}'s. These may be submitted to the EPA Project Officer before the PADRE system is used, so they will be available to the system when the impactor configuration is specified. These constants include:

- Scale factor for pressure drop,
- Number of holes in each stage,
- Average diameter of the holes,
- Fractional cumulative pressure drop across each stage, and
- Stokes' constant (C_{50}) for each stage.

The calibration date also is required. Calibration information for a specific impactor is sought by the impactor type (e.g., Andersen and Brink), the impactor model (e.g., Mark III), and a unique number assigned to the set of plates used in the calibration run. If the user does not know the calibration constants for his impactor but wants to conduct preliminary analyses, he may specify the impactor type and model with plate set ID zero to access "generic" calibration constants. The validity of the D_{50}'s will, of course, depend on how closely his impactor corresponds to the mythical impactor the generic calibration constants describe.

TERMINAL

Access to PADRE requires an interactive computer terminal. All program printed lines contain less than 80 characters. Any terminal that can access the NCC in Research Triangle Park, North Carolina, may be used, but one that produces a permanent "hard copy" to document the PADRE session is recommended.

The basic requirement is that the terminal emulate a teletype at 30 or 120 characters per second and handle computer communications with even parity. PADRE has been developed in anticipation that a field-portable terminal like a Texas Instruments "Silent 700" (e.g., Model 745) would be used. However, any terminal that emulates a teletype may be used.

Substrates ID (assigned) _____ _____ _____ _____
Description _____ _____ _____ _____
No. of weights _____ _____ _____ _____

Units of all weights should be milligrams. Order should be from largest particles to smallest particles; first stage, ..., last stage, backup filter (if used).

1. Pre-weight				
Post-weight				
2. Pre-weight				
Post-weight				
3. Pre-weight				
Post-weight				
4. Pre-weight				
Post-weight				
5. Pre-weight				
Post-weight				
6. Pre-weight				
Post-weight				
7. Pre-weight				
Post-weight				
8. Pre-weight				
Post-weight				
9. Pre-weight				
Post-weight				
10. Pre-weight				
Post-weight				

Figure 4. PADRE Data Entry Form: Weight Data.

Contractor ID, CNRTR:____ Site ID, SITE:____ Test Date, IDATE:____

Test Comments, TCOMM _____

Assumed particle density, RHO _____ g/ml

Run index, IRUN (assigned)			
Run comments, RCOMM			
Run date, JDATE			
Start time, ISTART			
Duration, DUR (min)			
Run type, RTYPE			
% H_2O in stack gas			
Composition of dry stack gas			
% CO_2			
% CO			
% N_2			
% O_2			
Ambient pressure, PAMBNT (in. Hg)			
Stack P wrt ambnt, DPSTK (in. H_2O)			
Stack temperature, TSTACK (°F)			
Stack gas velocity, VSTACK (ft/s)			
Impactor temperature, TIMP (°F)			
Flow rate determination method			
if EPA method 5, then			
initial gas vol., GMVOLI (ft^3)			
final gas vol., GMVOLF (ft^3)			
volume water collected, VOLH_2O (ml)			
temp. of meter, TMETER (°F)			
meter calibration factor CMETER			
orifice ΔP, DPORIF (in. H_2O)			
else			
Impactor flow rate, FLOW (ft^3/min)			
Max. particle dia., DMAX (microns)			
Cyclone cut point, CYCL (microns)			
Nozzle diameter, DNOZZ (in.)			
Nozzle cut point, CUTNOZ (microns)			
Was backup filter used? BF			
Large particles on filter? FLARGE			
Impactor type, IMPNAM			
Impactor model, IMPMOD			
Impactor plate set ID, IPLATE			
Number of stages used, NS (Do not count cyclone or backup filter)			
Substrates ID, IDSUBS (assigned)			

Figure 5. PADRE Data Entry Form: Run Data.

PADRE Date Entry Form: IMPACTOR Data

Impactor type, IMPNAM _____

Impactor model, IMPMOD _____

Impactor plate set ID, IPLATE _____

Calibration data CDATE _____

Number of stages, NSTAGE _____

Scale factor, SCALE _____

Stage	No. holes NJETS	Avg. hole diameter DJETS (cm)	Cumulative fractional pressure drop CUMDP (atm)	Stokes no. STOKES
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Figure 6. PADRE Data Entry Form: Impactor Data

SECTION 4

OPERATING INSTRUCTIONS

CONNECTION WITH THE COMPUTER--PADRE

Please check with the EPA Project Officer before attempting to run PADRE. He will answer any questions you may have about this document and will assign your unique UNIVAC Run-ID.

The first step in using PADRE is to establish communication with the UNIVAC computer at EPA/NCC, generally through the TYMNET® national telecommunications network. In metropolitan areas, a user can dial a local telephone number to gain access to the system. If you cannot find the TYMNET® number in the local telephone book, call the NCC Telecommunications office at (919) 541-4506 for instructions. When you have determined the correct number, dial it, wait for a tone, and place the phone receiver in the acoustic coupler for your terminal or make the appropriate connection between the phone and your terminal.

1. After a few seconds, you will be asked to enter your terminal type. Respond with "A."

   Figure 7 shows each line the computer will print on your terminal to prompt you and each line you should enter in response. It includes the output from a sample session, beginning with this signon procedure.

2. You will then be asked to log in.

   Enter "(Control H)UNIEPA1;NCC (Carriage Return = CR)."

   If you make a typographical error in this entry, TYMNET® will respond with ERROR, TYPE USER NAME:; you should then enter "UNIEPA1." Next, you will be prompted with PASSWORD:; now enter "NCC." After a brief pause, the computer will respond UNIV IS ONLINE.

3. Be sure your terminal is set to even parity and uppercase. The first time you do this, you may need to consult the operating manual that came with your terminal.

   Enter "UNIVAC (CR)."

   The computer will then prompt you with ENTER USERID/PASSWORD:.

Preceding page blank

```
Please type your terminal identifier
-1447-001-
Please log in:UNIEPA,INCC
?  6
UNIT IS ON LINE
@UNIVAC
@@@@@@@@@@@@@@   ENTER USERID/PASSWORD:
*DESTROY USERID/PASSWORD ENTRY
*UNIVAC 1100 OPERATING SYSTEM  LEV. 37N2C-30-148(R5I)*
    ***  SAR R2.35A SCP PROCESSOR IS NOW AVAILABLE IN PRODUCTION FILE  ***
>@@TTY C.I.
-@@COMPLETE
:@RUN 3:ATT.630ZZEADBS:EADS/EADSPPAD
DATE: 040783          TIME: 14:43.2
*** NEWS CURRENT AS OF 14:29:25 ON 03/09/83 ***

:@ADD MAY-RUN,PADRE
AUP-UID LOGGED TO SYSTEM LOG
READY
READY
READY
READY
READY
READY
READY
READY
**********************************************************************
                    * PADRE BULLETIN BOARD *

If you have trouble signing on,
                check the NCC System Status Recordins at (919)541-2226 or -2227.
For immediate assistance, information, etc.,
                call BILL YEAGER 919/541-6287 or GENE TATSCH 919/541-6930.
**********************************************************************
READY
*** PARTICLE DATA REDUCTION AND ENTRY SYSTEM  RELEASE 1.4  04/07/83     15:40:23
DO YOU WANT AN INTRODUCTION TO PADRE?  ENTER Y OR N
/N

DO YOU WANT TO ENTER DATA OR TO MODIFY WEIGHT OR TEST DATA?  ENTER Y OR N
/Y

DO YOU WISH TO ENTER OR MODIFY ANY WEIGHTS? ENTER Y OR N
/N
DO YOU WISH TO ENTER OR MODIFY ANY TEST DATA?  ENTER Y OR N.
/N

DO YOU WISH TO ENTER DATA FOR A RUN? ENTER Y OR N.
/N

DO YOU WANT TO ENTER DATA OR TO MODIFY WEIGHT OR TEST DATA?  ENTER Y OR N
/N

DO YOU WISH TO RETRIEVE RUN DATA?  ENTER Y OR N
/Y
ENTER YOUR SITE CODE, SITE (4 CHAR)
/CCL
ENTER TEST DATE, IDATE (MMDDYY)
/11376
ENTER THE RUN NUMBER, IRUN
/2
    *** MAX. PARTICLE DIAM., DMAX, IS LARGE

DO YOU WISH TO LIST THE DATA FOR RUN? ENTER Y OR N
/N

DO YOU WISH TO MODIFY ANY RUN CONDITIONS?  ENTER Y OR N
/N
WANT TO RETRIEVE ANOTHER RUN?  ENTER Y OR N
/N

DO YOU WISH TO TO REDUCE THE DATA? ENTER Y OR N
/N

DO YOU WISH TO PRINT FPEIS CODING FORMS?   ENTER Y OR N
/N
WANT TO RETRIEVE ANOTHER RUN?  ENTER Y OR N
/N
DO YOU WISH TO RETRIEVE A TEST?  ENTER Y OR N
/Y
ENTER SITE CODE, SITE (4 CHAR)
/CCL
ENTER TEST DATE, IDATE, (MMDDYY)
/11376

DO YOU WISH TO REVIEW ALL RUNS IN A TEST?  ENTER Y OR N?
/N

 DO YOU WISH TO COMPARE SEVERAL RUNS? ENTER Y OR N
/N
 DO YOU WISH TO CALCULATE PENETRATION AND EFFICIENCY?  ENTER Y OR N
/N

DO YOU WANT EXPANDED OUTPUT MAILED TO YOU?  ENTER Y OR N.
/N

DO YOU WISH TO RETRIEVE DATA FROM ANOTHER TEST?  ENTER Y OR N
/N

DO YOU WISH TO RETURN TO THE BEGINNING OF PADRE? ENTER Y OR N
/N

DO YOU HAVE ANY COMMENTS ON THIS PROGRAM OR ITS DOCUMENTATION? ENTER Y OR N
/N
EXIT FROM PADRE
ENTER 0FIN TO EXIT FROM THE UNIVAC
/0FIN
```

Figure 7. PADRE logon and abbreviated session.

Enter the User-ID followed by a slash followed by the password for that User-ID (no spaces allowed).

Values for current demonstration USERID/PASSWORD, etc., are shown in Figure 7. Contact the support staff for current values if these have expired. You are now connected with the UNIVAC computer. When the computer is ready for you to enter data or a command, it will type a ">" symbol at the beginning of the line. If you enter something before the computer is ready, it will respond with *WAIT-LAST INPUT IGNORED*. When this happens, wait for the > and reenter the data or command.

4. Set the character delete key.

   Enter "@@TTY C,e (CR)" where "e" is the character you will use to "erase" an erroneous character.

   The backspace key is commonly used for this function. If your terminal has no backspace key, use some key that you will not need when entering data or comments; e.g., the DEL key on a TI745 terminal. The " " symbol has been used for the sample sessions. The computer will respond with @@COMPLETE.

5. Enter the RUN statement, specifying the housekeeping information to the computer exactly as shown in Figure 6. Note that your own Run-ID (assigned by EPA Project Officer) must be used rather than "43CET" because the latter serves as a number of functions, including output-routing. The computer will respond with the current date and time.

6. To activate the PADRE system, enter "@ADD WMY-RUN.PADRE (CR)." The computer will respond with several "READY's" and the bulletin board, and present you with the first of a series of options.

PADRE LOGICAL CONTROL

You can follow several paths through this program. For example, you may wish only to enter pre-weights for several sets of substrates, or you may wish either to update or to reduce previously entered data. You will be offered a series of options at decision points. At each decision point, you will be asked a question of the form "DO YOU WISH TO ...? ENTER Y OR N." You may

choose either to accept the option (e.g., enter data for a new run) or to continue to the next decision point in the program, where you will be offered another option. Indicate your decision by entering Y or N; then depress the return key on the terminal. Any response other than Y or N will be rejected and you will again be prompted to enter Y or N.

The flowchart in Figure 8 is a guide to the options this program offers. There are three basic sections or loops. At the end of each section, you will have the option either to return to the beginning of that section or to proceed to the next section. After the last section, you will have the option to return to the beginning of the first section.

No "dead ends" exist in PADRE. If you take a wrong path, you can drop through to the bottom of the section, or of the program, and return to the beginning.

ESCAPE MECHANISM

If you wish to abort PADRE at any point, enter "@@X TIOC (CR)." After you have terminated the program, either normally or abnormally (using @@X), the UNIVAC operating system will prompt you for your next command with a ">" symbol in column 1. Enter "@FIN (CR)" to terminate the run and restore the status of all data files. You will then receive a summary of the computer resources you have used and EADS accounting information. (Note: should all measures fail, you can stop everything by hanging up the phone.) If you have reduced (analyzed) some data and indicated you want the expanded output in addition to that listed on the terminal, it will be printed at NCC and mailed to the address associated with your Run-ID ("21RTI" in the example).

DATA ENTRY AND REVIEW

Eventually, you will reach a point when you should enter observed data. You will be prompted with a brief description of and the name associated with the data item. The computer will then wait for you to enter the data. If you have completed copies of the data entry forms (see Figure 4-5) before logging on, you will be familiar with the required data and will be prepared to respond without searching records for each value. After all items have been entered, there will be a review of the data, listing both the names and values. You will then have an opportunity to mark which, if any, items you wish to change. If you do not want to change any of the data items named,

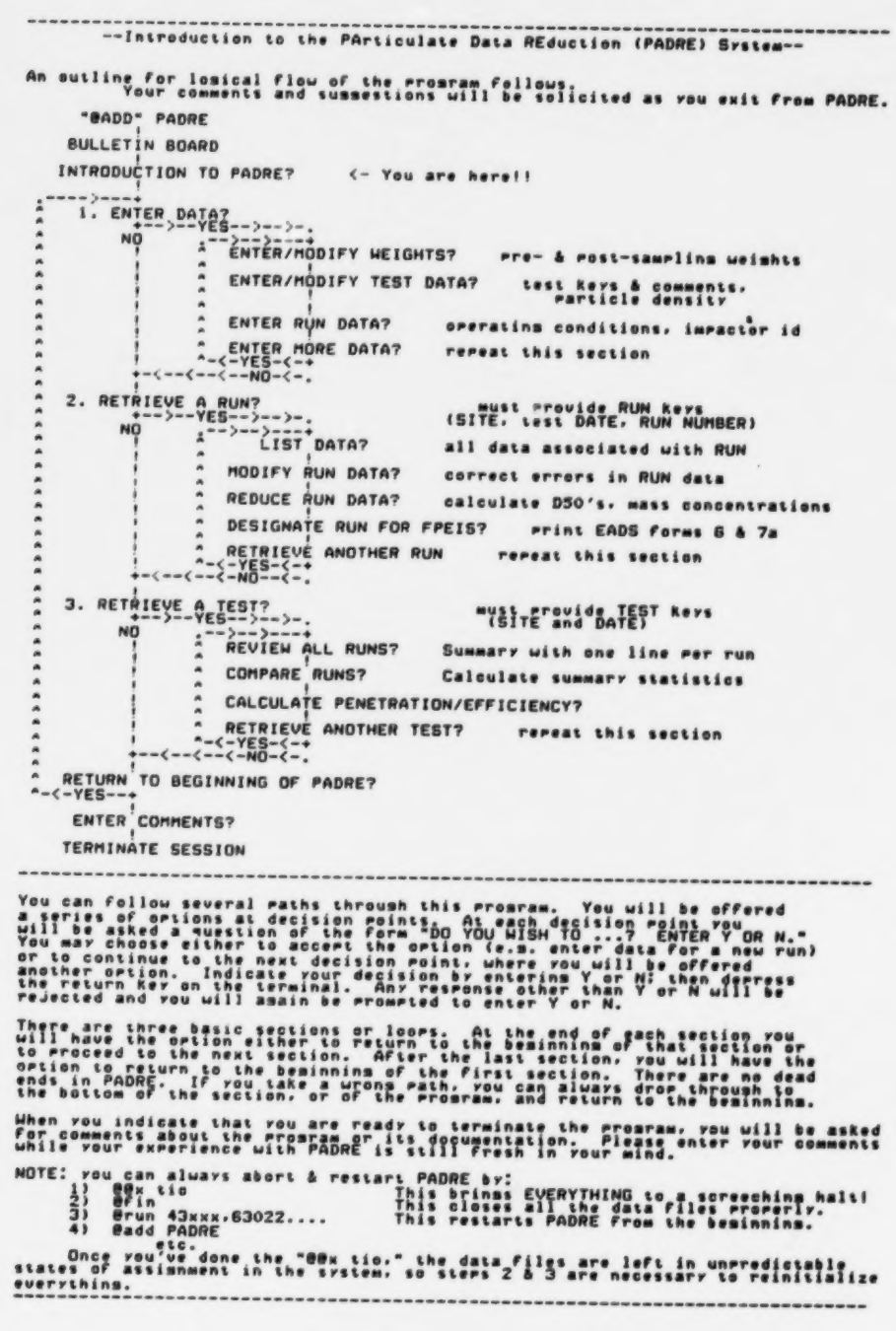

--Introduction to the PArticulate Data REduction (PADRE) System--
An outline for logical flow of the program follows.
Your comments and suggestions will be solicited as you exit from PADRE.
"@ADD" PADRE
BULLETIN BOARD
INTRODUCTION TO PADRE? <- You are here!!
1. ENTER DATA?
YES
NO
ENTER/MODIFY WEIGHTS? pre- & post-sampling weights
ENTER/MODIFY TEST DATA? test keys & comments, particle density
ENTER RUN DATA? operating conditions, impactor id
ENTER MORE DATA? repeat this section
2. RETRIEVE A RUN? must provide RUN keys (SITE, test DATE, RUN NUMBER)
YES
NO
LIST DATA? all data associated with RUN
MODIFY RUN DATA? correct errors in RUN data
REDUCE RUN DATA? calculate D50's, mass concentrations
DESIGNATE RUN FOR FPEIS? print EADS forms 6 & 7a
RETRIEVE ANOTHER RUN repeat this section
3. RETRIEVE A TEST? must provide TEST keys (SITE and DATE)
YES
NO
REVIEW ALL RUNS? Summary with one line per run
COMPARE RUNS? Calculate summary statistics
CALCULATE PENETRATION/EFFICIENCY?
RETRIEVE ANOTHER TEST? repeat this section
RETURN TO BEGINNING OF PADRE?
YES
ENTER COMMENTS?
TERMINATE SESSION
You can follow several paths through this program. You will be offered a series of options at decision points. At each decision point you will be asked a question of the form "DO YOU WISH TO ...? ENTER Y OR N." You may choose either to accept the option (e.g. enter data for a new run) or to continue to the next decision point, where you will be offered another option. Indicate your decision by entering Y or N; then depress the return key on the terminal. Any response other than Y or N will be rejected and you will again be prompted to enter Y or N.
There are three basic sections or loops. At the end of each section you will have the option either to return to the beginning of that section or to proceed to the next section. After the last section, you will have the option to return to the beginning of the first section. There are no dead ends in PADRE. If you take a wrong path, you can always drop through to the bottom of the section, or of the program, and return to the beginning.
When you indicate that you are ready to terminate the program, you will be asked for comments about the program or its documentation. Please enter your comments while your experience with PADRE is still fresh in your mind.
NOTE: you can always abort & restart PADRE by:
1) @@x tio This brings EVERYTHING to a screeching halt!
2) @fin This closes all the data files properly.
3) @run 43xxx,63022.... This restarts PADRE from the beginning.
4) @add PADRE
etc.
Once you've done the "@@x tio," the data files are left in unpredictable states of assignment in the system, so steps 2 & 3 are necessary to reinitialize everything.

Figure 8. PADRE introduction.

depress the return key. If you make changes, there will be another review and opportunity to make further changes. When you have been through the entire list of variables and have made no changes, the system will proceed to the next decision point.

RETRIEVING STORED DATA

PADRE manages all data storage and retrieval for the user, but certain user requirements are basically matters of good housekeeping. These requirements are also essential for retrieving stored data.

- Substrate weights are assigned an ID by PADRE (see Figure 9).
- Run data are saved by PADRE using multiple keys (see Figure 12).

To retrieve stored data, the user must specify these keys exactly as originally specified or assigned. Whenever PADRE stores data, it prints a message with the keys that must be used to retrieve those data. Note that space for these keys is provided on the PADRE data entry forms (see Figure 4); you may wish to fill them in when the data are first entered.

If you want to recall data for an old (previously entered) run, you must specify the same site ID and test date you used when you originally entered the data, as well as the run number assigned by PADRE. Whenever a set of run data is stored, a line with these three key items and your contractor mnemonic ("RTI" in the example) is printed on the terminal (see Figure 12). These keys should be recorded for future reference. You will be prompted for each of these items at the appropriate point in the session. If you want to recall data from an old test so you can modify the test data, you must specify the same site ID and test date as you did when the test data were entered. You can then change any of the test data; if you change any of the key items, the system will alter them for all runs in that test.

Sample sessions

Figures 9 through 20 show actual PADRE dialog for basic operations. A set of data from the CIDRS manual is entered, edited, and reduced. Expanded output, including a line printer version of FPEIS coding forms 6a and 7 is produced. All runs in a test are reviewed, the input runs are compared, and the efficiency of the control device is calculated.

```
...
DO YOU WANT TO ENTER DATA OR TO MODIFY WEIGHT OR TEST DATA?  ENTER Y OR N
>Y

DO YOU WISH TO ENTER OR MODIFY ANY WEIGHTS? ENTER Y OR N
>Y
ENTER ID OF SUBSTRATES YOU WISH TO MODIFY OR 0 (ZERO) FOR A NEW SET
>21
DO YOU WISH TO CHANGE THE NUMBER OF WEIGHTS IN THE SET?  ENTER Y OR N
>N
 PRE-WEIGHTS
 10.000  10.000  10.000  10.000  10.000  10.000  10.000  10.000  10.000
ENTER A MARK UNDER THE ITEM YOU WISH TO CHANGE OR RETURN
>
DO YOU WISH TO ENTER OR UPDATE ANY POST-WEIGHTS? ENTER Y OR N
>Y
ENTER POST-WEIGHT   1
>11.22
ENTER POST-WEIGHT   2
>11.29
ENTER POST-WEIGHT   3
>10.58
ENTER POST-WEIGHT   4
>10.18
ENTER POST-WEIGHT   5
>11.53
ENTER POST-WEIGHT   6
>14.39
ENTER POST-WEIGHT   7
>11.90
ENTER POST-WEIGHT   8
>10.54
ENTER POST-WEIGHT   9
>10.54
 POST-WEIGHTS
 11.220  11.290  10.580  10.180  11.530  14.390  11.900  10.540  10.540
ENTER A MARK UNDER THE ITEM YOU WISH TO CHANGE OR RETURN
>         X                                              X
ENTER POST-WEIGHT   2
>10.29
ENTER POST-WEIGHT   8
>10.39
 POST-WEIGHTS
 11.220  10.290  10.580  10.180  11.530  14.390  11.900  10.390  10.540
ENTER A MARK UNDER THE ITEM YOU WISH TO CHANGE OR RETURN
>
SUBSTRATES DESCRIPTION: GREASED FOIL
SUBSTRATE  PRE-WEIGHT  POST-WEIGHT   NET MASS (MG)
   1       10.000      11.220        1.220
   2       10.000      10.290         .290
   3       10.000      10.580         .580
   4       10.000      10.180         .180
   5       10.000      11.530        1.530
   6       10.000      14.390        4.390
   7       10.000      11.900        1.900
   8       10.000      10.390         .390
   9       10.000      10.540         .540
DO YOU WISH TO CHANGE THE SUBSTRATES DESCRIPTION? ENTER Y OR N
>N
DO YOU WISH TO CHANGE ANY WEIGHTS?  ENTER Y OR N
>N
SUBSTRATE DESCRIPTION, WEIGHTS SAVED IN RECORD          21
DO YOU WISH TO ENTER OR MODIFY MORE WEIGHTS? ENTER Y OR N
>N

DO YOU WISH TO ENTER OR MODIFY ANY TEST DATA?  ENTER Y OR N.
>N
```

Figure 9. Entry of presampling substrate weights

```
DO YOU WANT TO ENTER DATA OR TO MODIFY WEIGHT OR TEST DATA?  ENTER Y OR N
>Y

DO YOU WISH TO ENTER OR MODIFY ANY WEIGHTS? ENTER Y OR N
>Y
ENTER ID OF SUBSTRATES YOU WISH TO MODIFY OR 0 (ZERO) FOR A NEW SET
>21
DO YOU WISH TO CHANGE THE NUMBER OF WEIGHTS IN THE SET?  ENTER Y OR N
>N
 PRE-WEIGHTS
 10.000  10.000  10.000  10.000  10.000  10.000  10.000  10.000  10.000
ENTER A MARK UNDER THE ITEM YOU WISH TO CHANGE OR RETURN
>
DO YOU WISH TO ENTER OR UPDATE ANY POST-WEIGHTS? ENTER Y OR N
>Y
ENTER POST-WEIGHT   1
>11.22
ENTER POST-WEIGHT   2
>11.29
ENTER POST-WEIGHT   3
>10.58
ENTER POST-WEIGHT   4
>10.18
ENTER POST-WEIGHT   5
>11.53
ENTER POST-WEIGHT   6
>14.39
ENTER POST-WEIGHT   7
>11.90
ENTER POST-WEIGHT   8
>10.54
ENTER POST-WEIGHT   9
>10.54
 POST-WEIGHTS
 11.220  11.290  10.580  10.180  11.530  14.390  11.900  10.540  10.540
ENTER A MARK UNDER THE ITEM YOU WISH TO CHANGE OR RETURN
>          X                                                  X
ENTER POST-WEIGHT   2
>10.29
ENTER POST-WEIGHT   8
>10.39
 POST-WEIGHTS
 11.220  10.290  10.580  10.180  11.530  14.390  11.900  10.390  10.540
ENTER A MARK UNDER THE ITEM YOU WISH TO CHANGE OR RETURN
>
SUBSTRATES DESCRIPTION: GREASED FOIL
SUBSTRATE   PRE-WEIGHT   POST-WEIGHT    NET MASS (MG)
   1         10.000        11.220          1.220
   2         10.000        10.290           .290
   3         10.000        10.580           .580
   4         10.000        10.180           .180
   5         10.000        11.530          1.530
   6         10.000        14.390          4.390
   7         10.000        11.900          1.900
   8         10.000        10.390           .390
   9         10.000        10.540           .540
DO YOU WISH TO CHANGE THE SUBSTRATES DESCRIPTION? ENTER Y OR N
>N
DO YOU WISH TO CHANGE ANY WEIGHTS?  ENTER Y OR N
>N
SUBSTRATE DESCRIPTION, WEIGHTS SAVED IN RECORD          21
DO YOU WISH TO ENTER OR MODIFY MORE WEIGHTS? ENTER Y OR N
>N

DO YOU WISH TO ENTER OR MODIFY ANY TEST DATA?  ENTER Y OR N.
>N
```

Figure 10. Entry of postsampling substrate weights; modifying substrate weights

```
DO YOU WISH TO ENTER OR MODIFY ANY WEIGHTS? ENTER Y OR N
>N

DO YOU WISH TO ENTER OR MODIFY ANY TEST DATA?  ENTER Y OR N.
>Y
ENTER SITE CODE, SITE (4 CHAR)
>RTP
ENTER TEST DATE, IDATE, (MMDDYY)
>032183
DO YOU WISH TO ENTER DATA FOR A NEW TEST?  ENTER Y OR N
>Y
ENTER TEST COMMENTS, TCOMM, (<= 80 CHAR)
>Demonstrate PADRE with sample Andersen data from CIDRS manual
ENTER PARTICLE DENSITY, RHO (GM/CC)
>2.4
CNTRTR= RTI    SITE= RTP    IDATE=  32183 TCOMM=
Demonstrate PADRE with sample Andersen data from CIDRS manual
RHO=    2.40000
ENTER A MARK UNDER VARIABLE(S) YOU WISH TO MODIFY OR RETURN
  SITE     IDATE    TCOMM    RHO
>
DATA FOR RUN  1 BY RTI  AT RTP  ON  32183 HAS BEEN SAVED IN THE TRIAL DATA FILE

DO YOU WISH TO ENTER DATA FOR A RUN? ENTER Y OR N.
>N
```

Figure 11. Entering test data

```
DO YOU WISH TO ENTER OR MODIFY ANY TEST DATA?  ENTER Y OR N.
>N

DO YOU WISH TO ENTER DATA FOR A RUN? ENTER Y OR N.
>Y

THE COMPLETE ID FOR THIS RUN IS CNTRTR=RTI  SITE=RTP  IDATE= 32183 IRUN= 1
*** RECORD THESE VALUES IN YOUR NOTEBOOK

ENTER RUN COMMENTS, RCOMM
>Demonstrate PADRE's capability to accept free form comments
ENTER DATE OF RUN, JDATE, AS MMDDYY
>32383
ENTER STARTING TIME OF RUN, ISTART, AS HHMM (24 HR CLOCK)
>1000
ENTER DURATION OF RUN, DUR, IN MINUTES
>60
ENTER RUN TYPE, RTYPE: I FOR INLET, O FOR OUTLET
>e
*** THE CHARACTER e IS NOT APPROVED FOR CODES.  RE-ENTER CODE e
>O
ENTER PERCENT H2O IN STACK GAS
>8
ENTER COMPOSITION OF DRY STACK GAS
ENTER PERCENT CO2
>14
ENTER PERCENT CO
>0
ENTER PERCENT N2
>80
ENTER PERCENT O2
>6
ENTER AMBIENT PRESSURE, PAMBNT (INCHES HG)
>30.06
ENTER STACK PRESSURE RELATIVE TO AMBIENT, DPSTK (INCHES H2O)
>0
ENTER STACK TEMPERATURE, TSTACK (DEG F)
>280
ENTER STACK GAS VELOCITY, VSTACK (FT/SEC)
>1.0
ENTER IMPACTOR TEMPERATURE, TIMP (DEG F)
>280-
WAS EPA METHOD 5 USED TO DETERMINE THE FLOW RATE? ENTER Y OR N
>N
ENTER NAME (<21 CHAR) OF METHOD USED
>UNKNOWN
ENTER IMPACTOR FLOW RATE, FLOW (ACFM, STACK COND.)
>0.358
ENTER PHYSICAL DIAMETER OF LARGEST PARTICLE COLLECTED, DMAX (MICRONS)
>49
ENTER NOZZLE DIAMETER, DNOZZ (INCHES)
>1.0
ENTER CUTPOINT OF NOZZLE, CUTNOZ (MICRONS) OR 0 (ZERO) FOR PADRE TO CALCULATE IT
>0
ENTER CUTPOINT OF CYCLONE, CYCL (MICRONS) OR 0 (ZERO) IF NONE USED
>0
ENTER NOZZLE/CYCLONE MASS, CMASS (MG)
>0
WAS BACKUP FILTER USED?  ENTER Y OR N.
>Y
DID BACKUP FILTER COLLECT LARGE PARTICLES?  ENTER Y OR N
>NO
DO YOU WANT TO INTERPOLATE MASS CONCENTRATIONS TO NON-STD. DIAM.?  ENTER Y OR N
>NO
ENTER IMPACTOR TYPE, IMPNAM
>ANDERSEN
ENTER IMPACTOR MODEL, IMPMOD
>UNKNOWN
ENTER PLATE SET ID, IPLATE, OR ZERO FOR GENERIC CALIBRATION
>3
ENTER NUMBER OF STAGES USED IN IMPACTOR, NS
>8
ENTER ID OF WEIGHT RECORD
>21
   *** MASS ON NOZZLE  IS LOW
DATA FOR RUN  1 BY RTI  AT RTP  ON  32183 HAS BEEN SAVED IN THE TRIAL DATA FILE

DO YOU WANT TO ENTER DATA OR TO MODIFY WEIGHT OR TEST DATA?  ENTER Y OR N
>N
```

Figure 12. Entering run data.

```
DO YOU WISH TO RETRIEVE RUN DATA?  ENTER Y OR N
>Y
ENTER SITE ID, SITE, (4 CHAR) OR RETURN TO USE CURRENT VALUE
>
ENTER TEST DATE, IDATE (MMDDYY), OR RETURN TO USE CURRENT VALUE
>
ENTER THE RUN NO., IRUN, OR RETURN TO USE CURRENT VALUE
>
   *** MASS ON NOZZLE  IS LOW

DO YOU WISH TO LIST THE DATA FOR RUN? ENTER Y OR N
>Y
DATA FOR TEST BY CONTRACTOR RTI , AT SITE RTP , ON DATE  32183, RUN NO.    1
TEST COMMENTS       TCOMM= Demonstrate PADRE with sample Andersen data from CIDRS
 manual
PARTICLE DENSITY (GM/CC): RHO=     2.400

RUN COMMENTS:       RCOMM= Demonstrate PADRE's capability to accept free form com
ments
DATE OF RUN:        JDATE=  32383  AMBIENT PRESSURE (IN HG)          PAMBNT=  30.06
START TIME:        ISTART=   1000  STACK PRESS WRT AMBIENT (IN H2O):DPSTK=    .00
RUN DURATION (MIN):  DUR=   60.0   STACK GAS VELOCITY (FT/SEC):     VSTACK=   1.00
RUN TYPE:          RTYPE= 0        STACK TEMPERATURE (DEG F):      TSTACK=  280.0
% CARBON DIOXIDE:     CO2=   14.0  IMPACTOR TEMPERATURE (DEG F):     TIMP=  280.0
% CARBON MONOXIDE:     CO=     .0  MAX. PARTICLE DIAM. (MICRONS):    DMAX=   49.0
% NITROGEN:           N2=   80.0  CYCLONE CUT POINT (MICRONS):      CYCL=     .0
% OXYGEN:             O2=    6.0  NOZZLE DIAMETER (INCHES):        DNOZZ=  1.000
% WATER VAPOR:       H2O=    8.0  NOZZLE CUT POINT (MICRONS):      CUTNOZ=    .00
BACKUP FILTER USED?    BF= YES     LARGE PARTICLES ON FILTER?       FLARGE= NO
FLOW RATE DETERMINATION: METHOD=UNKNOWN
IMPACTOR TYPE:    IMPNAM=ANDERSEN IMPACTOR FLOW RATE (ACFM):          FLOW=   .358
IMPACTOR MODEL:   IMPMOD=UNKNOWN
IMP. PLATE SET ID:IPLATE=      3  SUBSTRATES ID:                     IDSUBS=    21
NO. IMP. STAGES USED  NS=      8  DESCR=GREASED FOIL
NO. JETS  DIAM.   CUMDP   CALIB          NOZZLE          .000 MG
  264    .1671   .0000    .3050          STAGE  1       1.220
  264    .1281   .0000    .4300          STAGE  2        .290
  264    .0953   .0000    .4100          STAGE  3        .580
  264    .0780   .0000    .3850          STAGE  4        .180
  264    .0547   .0000    .3410          STAGE  5       1.530
  264    .0359   .1760    .3200          STAGE  6       4.390
  264    .0269   .2940    .3310          STAGE  7       1.900
  156    .0253 1.0000    .2740          STAGE  8        .390
IMPACTOR DP SCALING FACTOR      1.287  FILTER          .540 MG

DO YOU WISH TO MODIFY ANY RUN CONDITIONS?  ENTER Y OR N
>N
WANT TO RETRIEVE ANOTHER RUN?  ENTER Y OR N
>
```

Figure 13. Reviewing run data.

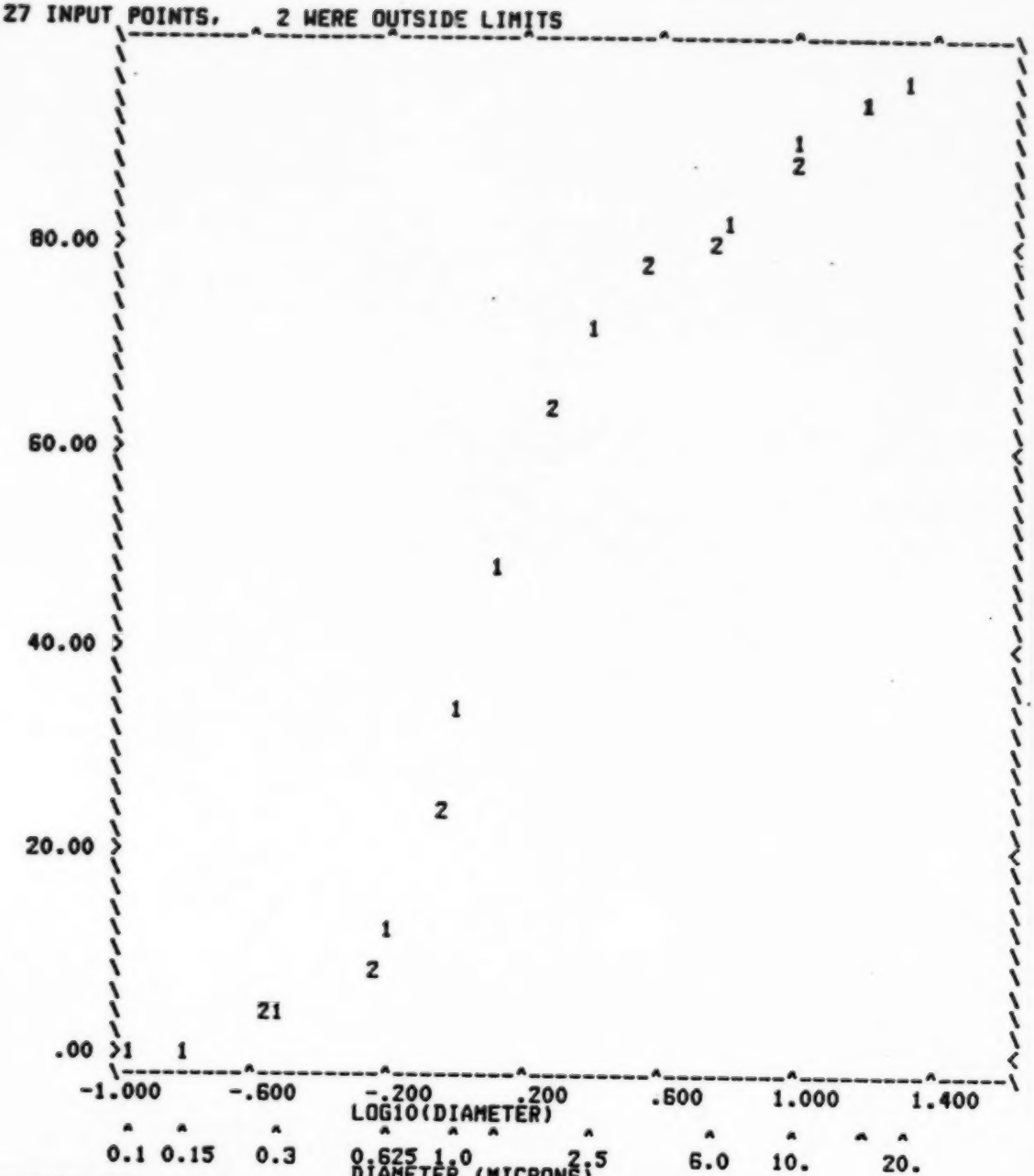
```
DO YOU WISH TO LIST THE DATA FOR RUN? ENTER Y OR N
>N

DO YOU WISH TO MODIFY ANY RUN CONDITIONS?  ENTER Y OR N
>Y
ENTER A MARK UNDER VARIABLE(S) YOU WISH TO MODIFY OR RETURN
    IRUN    RCOMM    JDATE    ISTART    DUR    RTYPE
>                     X                  X      X
*** ANOTHER RUN WITH THIS ID ALREADY EXISTS
THE NEW RUN NO. IS              3
ENTER RUN COMMENTS
>This run propagated from #1
ENTER NEW VALUE FOR ISTART
>1200
ENTER NEW VALUE FOR DUR
>60
ENTER A MARK UNDER VARIABLE(S) YOU WISH TO MODIFY OR RETURN
  PAMBNT    DPSTK   VSTACK   TSTACK    TIMP     DMAX     CYCL    DNOZZ    CUTNOZ   CMASS
>
ENTER A MARK UNDER VARIABLE(S) YOU WISH TO MODIFY OR RETURN
    CO2       CO        N2        O2        H2O       NS      IDSUBS   ACUTPT
>
ENTER A MARK UNDER VARIABLE(S) YOU WISH TO MODIFY OR RETURN
    BF     FLARGE   IMPNAM   IMPMOD   IPLATE    FLOW    METHOD
>
ENTER A MARK UNDER VARIABLE(S) YOU WISH TO MODIFY OR RETURN
    IRUN    RCOMM    JDATE    ISTART    DUR    RTYPE
>
   *** MASS ON NOZZLE  IS LOW
DO YOU WISH TO MODIFY THE INVALID VALUES?  ENTER Y OR N
>N
DATA FOR RUN  3 BY RTI  AT RTP  ON  32183 HAS BEEN SAVED IN THE TRIAL DATA FILE
DATA FOR TEST BY CONTRACTOR RTI , AT SITE RTP , ON DATE  32183, RUN NO.   3
TEST COMMENTS       TCOMM= Demonstrate PADRE with sample Andersen data from CIDRS
 manual
PARTICLE DENSITY (GM/CC): RHO=    2.400

RUN COMMENTS:          RCOMM= This run propagated from #1
DATE OF RUN:           JDATE=  32383  AMBIENT PRESSURE (IN HG)                  PAMBNT=  30.06
START TIME:           ISTART=   1200  STACK PRESS WRT AMBIENT (IN H2O):DPSTK=    .00
RUN DURATION (MIN):      DUR=   60.0  STACK GAS VELOCITY (FT/SEC):    VSTACK=   1.00
RUN TYPE:              RTYPE= 0       STACK TEMPERATURE (DEG F):     TSTACK=  280.0
% CARBON DIOXIDE:        CO2=   14.0  IMPACTOR TEMPERATURE (DEG F):    TIMP=  280.0
% CARBON MONOXIDE:        CO=     .0  MAX. PARTICLE DIAM. (MICRONS):    DMAX=   49.0
% NITROGEN:               N2=   80.0  CYCLONE CUT POINT (MICRONS):      CYCL=     .0
% OXYGEN:                 O2=    6.0  NOZZLE DIAMETER (INCHES):       DNOZZ=  1.000
% WATER VAPOR:          H2O=    8.0  NOZZLE CUT POINT (MICRONS):     CUTNOZ=    .00
BACKUP FILTER USED?      BF= YES      LARGE PARTICLES ON FILTER?      FLARGE= NO
FLOW RATE DETERMINATION: METHOD=UNKNOWN
IMPACTOR TYPE:       IMPNAM=ANDERSEN IMPACTOR FLOW RATE (ACFM):        FLOW=   .358
IMPACTOR MODEL:      IMPMOD=UNKNOWN
IMP. PLATE SET ID:IPLATE=      3  SUBSTRATES ID:
NO. IMP. STAGES USED  NS=      8  DESCR=GREASED FOIL                    IDSUBS=     0
NO. JETS   DIAM.    CUMDP   CALIB          NOZZLE          .000 MG
  264     .1671   .0000    .3050          STAGE  1         .000
  264     .1281   .0000    .4300          STAGE  2         .290
  264     .0953   .0000    .4100          STAGE  3         .580
  264     .0780   .0000    .3850          STAGE  4         .180
  264     .0547   .0000    .3410          STAGE  5        1.530
  264     .0359   .1760    .3200          STAGE  6        4.390
  264     .0269   .2940    .3310          STAGE  7        1.900
  156     .0253  1.0000    .2740          STAGE  8         .390
IMPACTOR DP SCALING FACTOR      1.287    FILTER           .540 MG
WANT TO RETRIEVE ANOTHER RUN?  ENTER Y OR N
>N
DO YOU WISH TO RETRIEVE A TEST?  ENTER Y OR N
>N
```

Figure 14. Modifying run data.

```
WANT TO RETRIEVE ANOTHER RUN?  ENTER Y OR N
>N

DO YOU WISH TO TO REDUCE THE DATA? ENTER Y OR N
>Y



 PARTICULATE DATA REDUCTION AND ENTRY SYSTEM      03/21/83          16:48:06
DATA FOR TEST BY CONTRACTOR RTI , AT SITE RTP , ON DATE  32183, RUN NO.  1
SAMPLING AT  109.4 % OF ISOKINETIC RATE
WANT TO SEE RESULTS USING CLASSICAL (STOKES) DEF. OF DIAM.?  ENTER Y OR N
>Y

Demonstrate PADRE's capability to accept free form comments
TOTAL MASS  7.9245-003  1.1979-002  1.8134+001  2.7412+001        DMAX=  49.0
              GR/ACF       GR/DNCF     MG/ACM      MG/DNCM              MICRONS

 STAGE       MASS        MASS      CUM. MASS       D50       GEO. MEAN  DM/DLOGD    DN/DLOGD
NOZZLE       (MG)     (MG/DNCM)   (MG/DNCM)   (MICRONS)    (MICRONS)  (MG/DNCM)  (NO/DNCM)
    1         .01          .02        27.39       38.80        43.60   2.45-001   2.35+003
    2        1.22         3.03        24.36        9.16        18.85   4.84+000   5.74+005
    3         .29          .72        23.63        8.66         8.91   2.97+001   3.34+007
    4         .58         1.44        22.19        5.26         6.75   6.65+000   1.72+007
    5         .18          .45        21.75        3.62         4.36   2.77+000   2.65+007
    6        1.53         3.80        17.94        1.83         2.58   1.29+001   5.98+008
    7        4.39        10.91         7.03         .86         1.26   3.33+001   1.33+010
    8        1.90         4.72         2.31         .55          .69   2.37+001   5.84+010
FILTER        .39          .97         1.34         .27          .39   3.24+000   4.46+010
                .54         1.34                                .19   4.46+000   4.89+011
   *** CUT POINTS FOR STAGES -1  0 ARE SIMILAR OR INVERTED
       MEASURED DATA FOR STAGE,  0 WITH D50=    38.80 OMITTED FROM INTERPOLATION
   *** CUT POINTS FOR STAGES  1  2 ARE SIMILAR OR INVERTED
       MEASURED DATA FOR STAGE,  2 WITH D50=     8.66 OMITTED FROM INTERPOLATION
INTERPOLATED TO STD. INTERVALS: (VALUES AT DIAM. MARKED WITH * ARE EXTRAPOLATED)
                                  1.47         .30                    .00
                                  3.56         .63                2.22+001
                                  9.72        1.00                3.99+001
                                 13.28        1.25                3.35+001
                                 20.15        2.50                1.34+001
                                 22.76        6.00                9.59+000
                                 24.69       10.00*               8.37+000
                                 25.95       15.00*               5.98+000
                                 26.59       20.00*               4.37+000
 WANT TO PLOT CUM. % MASS?  ENTER Y OR N
>Y
```

Figure 15. Reducing run data.

```
27 INPUT POINTS,    2 WERE OUTSIDE LIMITS
```




```
1 INTERPOLATED POINTS     2 MEASURED POINTS     3 NEARBY POINTS
WANT TO SEE RESULTS USING THE TGLD DEF. OF AERO. DIAM.?  ENTER Y OR N
>N
WANT TO SEE RESULTS USING MERCERS DEF. OF AERO. DIAM.?  ENTER Y OR N
>N
DO YOU WANT EXPANDED OUTPUT MAILED TO YOU?  ENTER Y OR N.
>Y

DO YOU WISH TO PRINT FPEIS CODING FORMS?   ENTER Y OR N
>Y
PRINT DATA ON CODING FORMS FOR TEST BY RTI , AT RTP , ON  32183, RUN NO.   1
WANT TO RETRIEVE ANOTHER RUN?  ENTER Y OR N
```

```
 PARTICULATE DATA REDUCTION AND ENTRY SYSTEM      03/21/83          16:48:06
DATA FOR TEST BY CONTRACTOR RTI , AT SITE RTP , ON DATE  32183, RUN NO.  1
TEST COMMENTS: DEMONSTRATE PADRE WITH SAMPLE ANDERSEN DATA FROM CIDRS MANUAL
RUN COMMENTS. DEMONSTRATE PADRE'S CAPABILITY TO ACCEPT FREE FORM COMMENTS

IMPACTOR DESCRIPTION AND CALIBRATION

TYPE: ANDERSEN  PLATE SET ID:    3
MODEL: UNKNOWN    IMPACTOR DP SCALING FACTOR:      1.287
STAGE  NO.JETS  DIAM.   CUTOP   CALIB
   1     264   .1671   .0000   .3850
   2     264   .1201   .0000   .4300
   3     264   .0953   .0000   .4100
   4     264   .0780   .0000   .3850
   5     264   .0547   .0000   .3410
   6     264   .0359   .1760   .3200
   7     264   .0269   .2940   .3310
   8     154   .0253  1.0000   .2740

IMPACTOR FLOWRATE =  .350 ACFM              IMPACTOR TEMPERATURE =  280.0 F (137.8 C)      SAMPLING DURATION =  60.00 MIN

IMPACTOR PRESSURE DROP =  .198 IN. OF HG    STACK TEMPERATURE =  280.0 F (137.C C)         STACK PRESSURE = 30.06 INCHES OF HG

DRY GAS COMPOSITION (PERCENT)      CO2 = 14.00          CO =  .00          N2 = 80.00          O2 =  6.00          H2O =  8.00

 CALC. MASS LOADING = 7.9245-003 GR/ACF              1.1979-002 GR/DNCF          1.8134+001 MG/ACM          2.7412+001 MG/DNCM
SAMPLING AT  109.4 % OF ISOKINETIC RATE

 DIAMETERS ARE CALCULATED HERE ACCORDING TO THE CLASSICAL (STOKES) DEFINITION

 ASSUMED PARTICLE DENSITY = 2.400GM/CU.CM.       MAX. PARTICLE DIAMETER =  49.0 MICRONS

IMPACTOR STAGE                  NOZZLE      S1      S2      S3      S4      S5      S6      S7      S8      FILTER
STAGE INDEX NO.                    1        2       3       4       5       6       7       8       9        10

D50 (MICRONS)                    38.80     9.16    8.66    5.26    3.62    1.83     .86     .55     .27     .27/2.0
MASS (MG)                         .01     1.22     .29     .58     .18    1.53    4.39    1.90     .39      .54
MG/DNCM/STAGE                 2.49-002 3.03+000 7.21-001 1.44+000 4.47-001 3.80+000 1.09+001 4.72+000 9.69-001 1.34+000
CUM. % OF MASS       < D50      99.91    88.85    86.22    80.96    79.33    65.46    25.66     8.43     4.98
CUM. MASS (MG/ACM)   < D50   1.81+001 1.61+001 1.56+001 1.47+001 1.44+001 1.19+001 4.65+000 1.53+000 8.88-001
CUM. MASS (MG/DNCM)  < D50   2.74+001 2.44+001 2.36+001 2.22+001 2.17+001 1.79+001 7.03+000 2.31+000 1.34+000
CUM. MASS (GR/ACF)   < D50   7.92-003 7.04-003 6.83-003 6.42-003 6.29-003 5.19-003 2.03-003 6.68-004 3.88-004
CUM. MASS (GR/DNCF)  < D50   1.20-002 1.06-002 1.03-002 9.70-003 9.50-003 7.84-003 3.07-003 1.01-003 5.86-004
GEO. MEAN DIA.(MICRONS)       4.36+001 1.89+001 8.91+000 6.75+000 4.36+000 2.58+000 1.26+000 6.86-001 3.86-001 1.94-001
DM/DLOGD (MG/DNCM)            2.45-001 4.84+000 2.97+001 6.65+000 2.77+000 1.29+001 3.33+001 2.37+001 3.24+000 4.46+000
DN/DLOGD (NUMBER/DNCM)        2.35+003 5.74+005 3.34+007 1.72+007 2.65+007 5.98+006 1.33+010 5.84+010 4.46+010 4.89+011
   *** CUT POINTS FOR STAGES -1  0 ARE SIMILAR OR INVERTED
       MEASURED DATA FOR STAGE,  0 WITH D50=   38.80 OMITTED FROM INTERPOLATION
   *** CUT POINTS FOR STAGES  1  2 ARE SIMILAR OR INVERTED
       MEASURED DATA FOR STAGE,  2 WITH D50=    8.66 OMITTED FROM INTERPOLATION
INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)
STD. DIA. (MICRONS)     .300     .625    1.000    1.250    2.500    6.000   10.000*  15.000*  20.000*
CUM. MASS (MG/DNCM)    1.471    3.561    9.722   13.278   20.153   22.759   24.686   25.950   26.595
DM/DLOGD (MG/DNCM)      .00  2.22+001 3.99+001 3.35+001 1.34+001 9.59+000 8.37+000 5.98+000 4.37+000

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.1
```

Figure 16. Expanded output: reduced data (at NCC).

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO THE TASK GROUP ON LUNG DYNAMICS.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 75.9 MICRONS

IMPACTOR STAGE STAGE INDEX NO.		NOZZLE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)		60.11	14.25	13.48	8.28	5.67	2.98	1.39	.98	.48	.48/2.0
MASS (MG)		.01	1.22	.29	.58	.18	1.53	4.39	1.98	.39	.54
MG/DNCM/STAGE		2.49-002	3.03+000	7.21-001	1.44+000	4.47-001	3.80+000	1.09+001	4.72+000	9.69-001	1.34+000
CUM. % OF MASS	< D50	99.91	88.85	86.22	80.96	79.33	65.46	25.66	8.63	4.90	
CUM. MASS (MG/ACM)	< D50	1.81+001	1.61+001	1.56+001	1.47+001	1.44+001	1.19+001	4.65+000	1.53+000	8.88-001	
CUM. MASS (MG/DNCM)	< D50	2.74+001	2.44+001	2.36+001	2.22+001	2.17+001	1.79+001	7.03+000	2.31+000	1.34+000	
CUM. MASS (GR/ACF)	< D50	7.92-003	7.04-003	6.83-003	6.42-003	6.29-003	5.19-003	2.03-003	6.68-004	3.88-004	
CUM. MASS (GR/DNCF)	< D50	1.20-002	1.06-002	1.03-002	9.70-003	9.50-003	7.84-003	3.07-003	1.01-003	5.86-004	
GEO. MEAN DIA.(MICRONS)		6.75+001	2.93+001	1.39+001	1.05+001	6.82+000	4.85+000	2.81+000	1.12+000	6.56-001	3.38-001
DM/DLOGD (MG/DNCM)		2.45-001	4.85+000	2.98+001	6.69+000	2.79+000	1.30+001	3.43+001	2.49+001	3.53+000	4.46+000
DM/DLOGD (NUMBER/DNCM)		1.52+003	3.69+005	2.14+007	1.18+007	1.68+007	3.74+008	8.07+009	3.39+010	2.38+010	2.28+011

*** CUT POINTS FOR STAGES -1 0 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 0 WITH D50= 60.11 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.48 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	1.751	3.326	5.739	16.310	21.762	23.634	24.552	25.525
DM/DLOGD (MG/DNCM)	3.53+000	2.31+001	2.67+001	2.77+001	2.44+000	9.36+000	8.48+000	6.98+000

AERODYNAMIC DIAMETERS ARE CALCULATED HERE ACCORDING TO MERCER.

ASSUMED PARTICLE DENSITY = 1.00GM/CU.CM. MAX. PARTICLE DIAMETER = 75.9 MICRONS

IMPACTOR STAGE STAGE INDEX NO.		NOZZLE 1	S1 2	S2 3	S3 4	S4 5	S5 6	S6 7	S7 8	S8 9	FILTER 10
D50 (MICRONS)		60.11	14.36	13.59	8.31	5.78	3.01	1.58	1.01	.58	.58/2.0
MASS (MG)		.01	1.22	.29	.58	.18	1.53	4.39	1.98	.39	.54
MG/DNCM/STAGE		2.49-002	3.03+000	7.21-001	1.44+000	4.47-001	3.80+000	1.09+001	4.72+000	9.69-001	1.34+000
CUM. % OF MASS	< D50	99.91	88.85	86.22	80.96	79.33	65.46	25.66	8.63	4.90	
CUM. MASS (MG/ACM)	< D50	1.81+001	1.61+001	1.56+001	1.47+001	1.44+001	1.19+001	4.65+000	1.53+000	8.88-001	
CUM. MASS (MG/DNCM)	< D50	2.74+001	2.44+001	2.36+001	2.22+001	2.17+001	1.79+001	7.03+000	2.31+000	1.34+000	
CUM. MASS (GR/ACF)	< D50	7.92-003	7.04-003	6.83-003	6.42-003	6.29-003	5.19-003	2.03-003	6.68-004	3.88-004	
CUM. MASS (GR/DNCF)	< D50	1.20-002	1.06-002	1.03-002	9.70-003	9.50-003	7.84-003	3.07-003	1.01-003	5.86-004	
GEO. MEAN DIA.(MICRONS)		6.75+001	2.94+001	1.40+001	1.06+001	6.93+000	4.17+000	2.12+000	1.23+000	7.65-001	4.12-001
DM/DLOGD (MG/DNCM)		2.45-001	4.85+000	3.01+001	6.76+000	2.83+000	1.34+001	3.61+001	2.72+001	4.08+000	4.46+000
DM/DLOGD (NUMBER/DNCM)		1.52+003	3.67+005	2.11+007	1.07+007	1.62+007	3.53+008	7.28+009	2.81+010	1.74+010	1.22+011

*** CUT POINTS FOR STAGES -1 0 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 0 WITH D50= 60.11 OMITTED FROM INTERPOLATION
*** CUT POINTS FOR STAGES 1 2 ARE SIMILAR OR INVERTED
MEASURED DATA FOR STAGE, 2 WITH D50= 13.59 OMITTED FROM INTERPOLATION

INTERPOLATED VALUES (VALUES AT DIAMETERS MARKED WITH * ARE EXTRAPOLATED)

STD. DIA. (MICRONS)	.625	1.000	1.250	2.500	6.000	10.000	15.000*	20.000*
CUM. MASS (MG/DNCM)	1.467	2.301	4.742	15.737	21.755	22.987	24.524	25.511
DM/DLOGD (MG/DNCM)	.99	1.38+001	2.75+001	3.06+001	3.06+000	9.50+000	8.48+000	6.99+000

NORMAL (ENGINEERING STANDARD) CONDITIONS ARE 21 DEG C AND 760MM HG.1

Figure 16 (continued). Expanded output: reduced data (at NCC).

```
DATA FOR TEST BY CONTRACTOR RTI  AT SITE RTP  ON DATE  32183  RUN NO.  1

                    E P A   E A D S   F P E I S          FORM 6

      1    1    2    2    3    3    4    4    5    5    6    6    7    7    8
   5  0    5    0    5    0    5    0    5    0    5    0    5    0    5    0
F        1H0D ANDERSEN  UNKNOWN   IMPACTOR 1000 60     138764 80 240   48
F        H1                                    1049MG

F        H2O                                   138764  101
F        H3   1400   0 6008000       1 4900      3

F        H5GREASED FOIL
F        H6DEMONSTRATE PADRE'S CAPABILITY TO ACCEPT FREE FORM COMMENTS


                    E P A   E A D S   F P E I S          FORM 7A

      1    1    2    2    3    3    4    4    5    5    6    6    7    7    8
   5  0    5    0    5    0    5    0    5    0    5    0    5    0    5    0
F        K5 1 STAGE  1         100E-02
F        K5 2 STAGE  2         122E+00
F        K5 3 STAGE  3         290E-01
F        K5 4 STAGE  4         580E-01
F        K5 5 STAGE  5         180E-01
F        K5 6 STAGE  6         153E+00
F        K5 7 STAGE  7         439E+00
F        K5 8 STAGE  8         190E+00
F        K5 9 FILTER            390E-01
```

Figure 17. FREIS coding forms (at NCC).

```
DO YOU WISH TO RETRIEVE RUN DATA?  ENTER Y OR N
>N
DO YOU WISH TO RETRIEVE A TEST?  ENTER Y OR N
>Y
ENTER SITE CODE, SITE (4 CHAR)
>COL
ENTER TEST DATE, IDATE, (MMDDYY)
>011376

DO YOU WISH TO REVIEW ALL RUNS IN A TEST?  ENTER Y OR N?
>Y
TEST BY RTI  AT COL  ON  11376  RHO= 2.40  TEST COMMENTS ARE
CIDRS SYSTEM TEST DATA: P362 FF.

INDEX TYPE DATE START DUR IDSUBS IMPACTOR     COMMENTS

  1    I   11376 1450  15. 292 BRIN  3 COLI-4 1-13-73 1450 4UAI: P364 CIDRS MAN
   *** MASS ON STAGE                7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE

  2    I   11376 1715  15. 472 BRIN  4 COLI-5 2UAI/P 365 CIDRS MANUAL.
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE

  3    I   11376 1822  15. 284 BRIN  1 COLI-7 10UAI/P. 366 CIDRS TESTING
   *** MASS ON STAGE                7  IS LOW
   *** MASS ON STAGE                8  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE

  4    I   11476 1520  15.  24 BRIN  1 COLI-10 1 UAI
   *** MASS ON STAGE                7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE

  5    I   11476 1600  15. 189 BRIN  4 COLI-12 5UAI/P 368
   *** MASS ON STAGE                7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE

  6    I   11576 1135  15. 419 BRIN  4 COLI-13 8UAI/P. 369 - TEST
   *** MASS ON STAGE                7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE

  7    O   11376 1630 120. 474 ANDE  3 COLO-19 PORTS 1,2,3/P 397 TEST.
   *** MASS ON NOZZLE  IS LOW

  8    O   11676 1336  90.  61 ANDE  2 COLO-31 PORTS 4,5,6/P. 398 TEST
   *** MASS ON NOZZLE  IS LOW

  9    O   11976 1544  84. 496 ANDE  4 COLO-37 PPORTS 4,5,6/PP. 399 TEST
   *** MASS ON NOZZLE  IS LOW

 10    O   12076  943 120.  78 ANDE  4 COLO-39 PORTS 1,2,3/P. 400 TEST
   *** MASS ON NOZZLE  IS LOW

 11    O   12076  945 120.  66 ANDE  5 COLO-40 PORTS 4,5,6/P. 401 TEST
*** WEIGHT RECORD                66 IS DELETED
   *** MASS ON NOZZLE  IS LOW
   ***** NET WEIGHTS HAVE NOT BEEN CALCULATED
*** DATA FOR THIS RUN IS INCOMPLETE.

*** RUN 12 BY RTI  AT COL  ON  11376 NOT FOUND
*** RUN 13 BY RTI  AT COL  ON  11376 NOT FOUND

 DO YOU WISH TO COMPARE SEVERAL RUNS? ENTER Y OR N
>N
 DO YOU WISH TO CALCULATE PENETRATION AND EFFICIENCY?  ENTER Y OR N
>N
```

Figure 18. Reviewing all runs in a test.

```
DO YOU WISH TO REVIEW ALL RUNS IN A TEST?  ENTER Y OR N?
>N

 DO YOU WISH TO COMPARE SEVERAL RUNS? ENTER Y OR N
>Y
ENTER DIAMETER DEFINITION (1=PHYSICAL, 2=AERODYNAMIC, 3=AERODYNAMIC IMPACTION)
>1
THE PHYSICAL (STOKES) DIAMETER WILL BE USED
 DO YOU WANT STATISTICS FOR 1=DM/DLOGD, 2=CUM. MASS, OR 3=CUM. % MASS?
>3
THE STD.DEV., MINIMUM, AND MAXIMUM OF THE CUM. % MASS WILL BE PRINTED
ENTER THE NO. OF STD. DEV. TO BE USED TO IDENTIFY POTENTIAL OUTLIERS.
>2
ENTER INDICES OF RUNS TO BE COMPARED SEPARATED BY BLANKS OR
   ENTER IN TO COMPARE ALL INLET RUNS IN THE TEST OR
   ENTER OUT TO COMPARE ALL OUTLET RUNS IN THE TEST
>IN

   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              1
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE            7
VALUE  5588.78
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              2
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE            7
VALUE  6409.47
   *** MASS ON STAGE              7  IS LOW
   *** MASS ON STAGE              8  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              3
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE            7
VALUE  6271.89
   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              4
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE            7
VALUE  6268.68
   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              5
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE            7
VALUE  6404.60
   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              6
   *** SAMPLING IS AT  10.1 % OF ISOKINETIC RATE
SAMPLING AT   10.1 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE            7
VALUE  6866.49
```

Figure 19. Comparing several runs

```
   *** MASS ON NOZZLE  IS LOW
   *** MASS ON NOZZLE  IS LOW
   *** MASS ON NOZZLE  IS LOW
   *** MASS ON NOZZLE  IS LOW
*** WEIGHT RECORD                66 IS DELETED
   *** MASS ON NOZZLE  IS LOW
    ***** NET WEIGHTS HAVE NOT BEEN CALCULATED
*** DATA FOR RUN RTI    COL     11376    II IS INCOMPLETE AND CANNOT BE USED

TEST SITE      COL        COL        COL        COL        COL        COL
TEST DATE    11376      11376      11376      11376      11376      11376
RUN NUMBER       1          2          3          4          5          6
RUN DATE     11376      11376      11376      11476      11476      11576
START TIME    1450       1715       1822       1520       1600       1135
TOTAL MASS 6.739E+03  7.480E+03  4.203E+03  1.495E+03  3.077E+03  7.075E+03

STD. DIAM.   CUM. % MASS < D50
 3    .30        .48        .90        .22       1.32        .99        .55
 4    .63        .99       1.51       1.21       3.20       1.51        .78
 5   1.00       1.89       2.39       2.41       5.34       2.35       1.27
 6   1.25       2.75       3.09       3.44       6.35       2.84       1.88
 7   2.50       7.10       6.73       8.80      14.96       7.15       5.55
 8   6.00      14.07      13.55      19.04      24.66      13.74      12.10
 9  10.00      24.81      16.94      23.83      30.53      17.68      15.53
10  15.00      35.17      22.66      30.05      35.52      23.62      21.69
11  20.00      44.28      30.71      37.78      39.64      31.67      30.10

DATA COMPARISON FOR    6 INLET  RUNS BY RTI
STD. DIAM.   NO.   DM/DLOGD   CUMULATIVE          CUM. % MASS < D50
(MICRONS)   RUNS  (MG/DNCM)  MASS < D50    AVG.    STD. DEV.    MIN.     MAX.
 3    .30     6   7.99E+01   3.30E+01        .74        .40        .22      1.32
 4    .63     6   1.03E+02   6.33E+01       1.53        .87        .78      3.20
 5   1.00     6   3.39E+02   1.08E+02       2.61       1.41       1.27      5.34
 6   1.25     6   4.41E+02   1.46E+02       3.39       1.54       1.88      6.35
 7   2.50     6   1.12E+03   3.65E+02       8.38       3.39       5.55     14.96
 8   6.00     6   1.01E+03   7.35E+02      16.19       4.78      12.10     24.66
 9  10.00     6   1.51E+03   1.01E+03      21.55       5.81      15.53     30.53
10  15.00     6   2.76E+03   1.35E+03      28.12       6.32      21.69     35.52
11  20.00     6   3.70E+03   1.76E+03      35.70       5.76      30.10     44.28
DO YOU WANT TO PLOT CUM % MASS?  ENTER Y OR N
>Y
```

Figure 19 (continued). Comparing several runs.

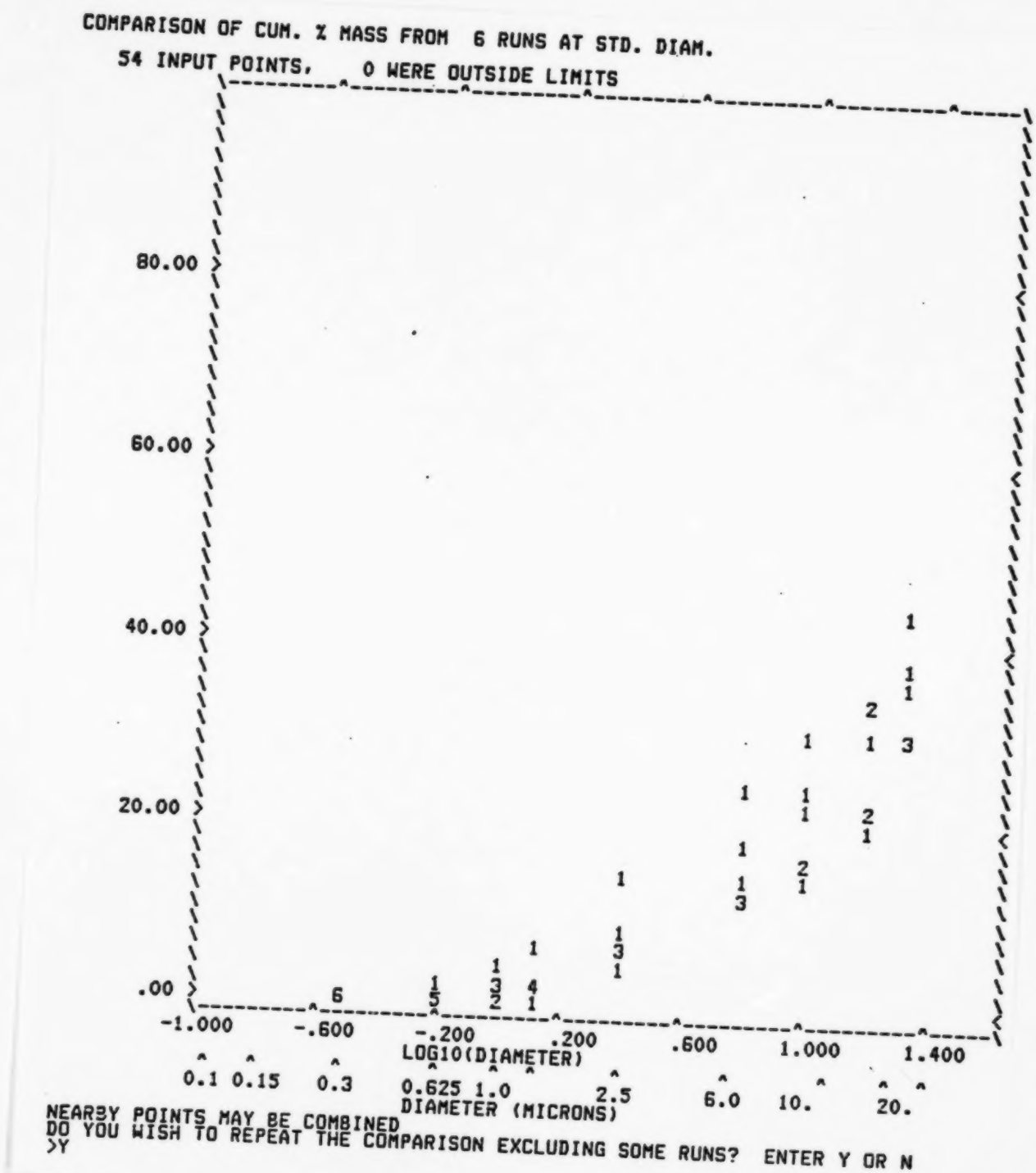


Figure 19 (continued). Comparing several runs.

```
ENTER INDICES OF RUNS WHICH YOU WISH TO EXCLUDE, SEPARATED BY BLANKS
>4

TEST SITE      COL        COL        COL        COL        COL
TEST DATE    11376      11376      11376      11376      11376
RUN NUMBER       1          2          3          5          6

DATA COMPARISON FOR    5 INLET  RUNS BY RTI
STD. DIAM.   NO.   DM/DLOGD   CUMULATIVE          CUM. % MASS < D50
(MICRONS)   RUNS  (MG/DNCM)   MASS < D50    AVG.    STD. DEV.    MIN.      MAX.
 3    .30     5   8.80E+01   3.56E+01        .63        .32        .22       .99
 4    .63     5   9.25E+01   6.64E+01       1.20        .32        .78      1.51
 5   1.00     5   3.76E+02   1.14E+02       2.06        .49       1.27      2.41
 6   1.25     5   4.97E+02   1.56E+02       2.80        .58       1.88      3.44
 7   2.50     5   1.28E+03   3.93E+02       7.06       1.16       5.55      8.80
 8   6.00     5   1.13E+03   8.08E+02      14.50       2.65      12.10     19.04
 9  10.00     5   1.74E+03   1.12E+03      19.76       4.25      15.53     24.81
10  15.00     5   3.21E+03   1.52E+03      26.64       5.79      21.69     35.17
11  20.00     5   4.33E+03   1.99E+03      34.91       6.07      30.10     44.28
DO YOU WANT TO PLOT CUM % MASS?  ENTER Y OR N
>N
DO YOU WISH TO REPEAT THE COMPARISON EXCLUDING SOME RUNS?  ENTER Y OR N
>N
 DO YOU WISH TO CALCULATE PENETRATION AND EFFICIENCY?  ENTER Y OR N
>N

DO YOU WANT EXPANDED OUTPUT MAILED TO YOU?  ENTER Y OR N.
>N
```

Figure 19 (continued). Comparing several runs.

```
 DO YOU WISH TO COMPARE SEVERAL RUNS? ENTER Y OR N
>N
 DO YOU WISH TO CALCULATE PENETRATION AND EFFICIENCY?  ENTER Y OR N
>Y
ENTER DIAMETER DEFINITION (1=PHYSICAL, 2=AERODYNAMIC, 3=AERODYNAMIC IMPACTION)
>1
THE PHYSICAL (STOKES) DIAMETER WILL BE USED
ENTER INDICES OF RUNS TO BE USED, SEPARATED BY BLANKS, OR
ENTER 0 (ZERO) TO USE ALL RUNS IN THE TEST
>0

   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              1
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE        7
VALUE  5588.78
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              2
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE        7
VALUE  6409.47
   *** MASS ON STAGE              7  IS LOW
   *** MASS ON STAGE              8  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              3
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE        7
VALUE  6271.89
   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              4
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE        7
VALUE  6268.68
   *** MASS ON STAGE              7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN              5
   *** SAMPLING IS AT   9.5 % OF ISOKINETIC RATE
SAMPLING AT    9.5 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE        7
VALUE  6404.60
```

Figure 20. Calculating penetration and efficiency.

```
   *** MASS ON STAGE                7  IS LOW
   *** MAX. PARTICLE DIAM., DMAX, IS LARGE
REDUCE DATA FOR RUN                6
   *** SAMPLING IS AT  10.1 % OF ISOKINETIC RATE
SAMPLING AT   10.1 % OF ISOKINETIC RATE
   *** JET VELOCITY > 5000 CM/SEC
STAGE     7
VALUE  6866.49
   *** MASS ON NOZZLE  IS LOW
REDUCE DATA FOR RUN                7
SAMPLING AT  122.5 % OF ISOKINETIC RATE
   *** MASS ON NOZZLE  IS LOW
REDUCE DATA FOR RUN                8
SAMPLING AT  126.8 % OF ISOKINETIC RATE
   *** MASS ON NOZZLE  IS LOW
REDUCE DATA FOR RUN                9
SAMPLING AT  121.0 % OF ISOKINETIC RATE
   *** MASS ON NOZZLE  IS LOW
REDUCE DATA FOR RUN               10
SAMPLING AT  125.3 % OF ISOKINETIC RATE
*** WEIGHT RECORD               66 IS DELETED
   *** MASS ON NOZZLE  IS LOW
    ***** NET WEIGHTS HAVE NOT BEEN CALCULATED
*** DATA FOR RUN RTI    COL    11376   11 IS INCOMPLETE AND CANNOT BE USED
  STD. DIAM.   PENETR.     ERR.     EFFICIENCY    ERR.
        .30     .05389    .04516      94.611     79.275
        .63     .14127    .08988      85.873     54.634
       1.00     .05582    .03880      94.418     65.626
       1.25     .04085    .03092      95.915     72.605
       2.50     .01273    .00977      98.727     75.791
       6.00     .03018    .02208      96.982     70.930
      10.00     .01453    .01219      98.547     82.661
      15.00     .00354    .00266      99.646     74.995
      20.00     .00117    .00111      99.883     94.947

DO YOU WANT EXPANDED OUTPUT MAILED TO YOU?  ENTER Y OR N.
>N

DO YOU WISH TO RETRIEVE DATA FROM ANOTHER TEST?  ENTER Y OR N
>N

DO YOU WISH TO RETURN TO THE BEGINNING OF PADRE? ENTER Y OR N
>N

DO YOU HAVE ANY COMMENTS ON THIS PROGRAM OR ITS DOCUMENTATION? ENTER Y OR N
>Y
PLEASE ENTER YOUR COMMENTS NOW.  ENTER RETURN WHEN YOU ARE FINISHED
>Enter comments on PADRE or its documentation while they are fresh in your mind
>
THANK YOU FOR YOUR COMMENTS
EXIT FROM PADRE
ENTER @FIN TO EXIT FROM THE UNIVAC
>@fin
```

Figure 20 (continued). Calculating penetration and efficiency.

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